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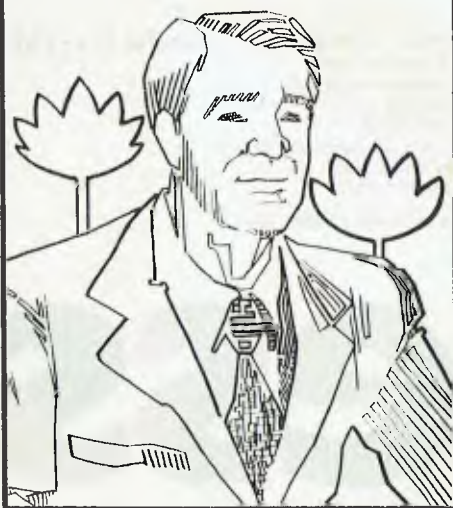
Macintosh

Here's Macintosh...
Apples latest release should have
what it takes, P19.



Lisa

Your Business Computer
features Apple's Lisa and Mitch
Kapor, author of Lotus 1-2-3.



special

19

A New Lisa Life for Apple

It's a year since Lisa leapt upon the scene, a year during which the vast majority of the population has not bought Lisas, mostly because of price. Macintosh is what they've been waiting for, says Les Bell.

reviews

29

The Roland Plot

It was just a matter of time before someone hatched a quality plotter with a reasonable price tag. Jeff Richards reviewed Roland DG's DXY Single Pen X-Y Flatbed Plotter for us.

46

A User's View Of The C64

The Commodore 64 hasn't been around for long, but it has plenty of dedicated users. Numbering himself among them, Michael Jennings reports on his machine.

48

Reach For The Stars

A strategic-level simulation of galactic colonisation, exploration and expansion, this is the latest game by Australian programmer Roger Keating, and is currently available for the Apple II, IIe and Commodore 64 computers. Greg Whiley reviewed it for us.

83

Busycalc On The Bee

One of the most powerful classes of software available for microcomputers is the electronic spreadsheet. Paul Fisher takes a look at Applied Technology's Busycalc.

84

Micro-Decision, Macro-Result

Written by Robert Deane, who confesses he wouldn't know a bus from a byte, this article outlines how he came to buy a Morrow Micro-Decision, harness it to an Olympia ES100 and get excellent, reliable results.

features



40

Great Micros Of The Past

Continuing our occasional series, John Newman gives an account of how his longing for a 'personal' computer was satisfied by a CompuColor II and how he has continued to expand its usefulness.


96

Playing With Your Microbee's Video Display

Have you ever wondered how to

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make your Microbee display 80 characters across the screen, or change its cursor, or produce more rows of text on the screen? Eric Lindsay explains how these changes can be accomplished from within your programs.



102 Quick Robin - Into The Battpac

Although a portable computer, until recently the Osborne's ability to stray from the confines of mains voltage was directly proportional to the length of extension cord available. This irony was rectified when the Battpac, a portable power pack became available. Derek Morris reviewed it for us.

departments

37 Textfile

Your letters to *Your Computer* - let us know what we're doing right (or wrong), ask other readers for help, air your pet whinge - just write to us.

89 Book Reviews

This month we review the Texas Instruments series of textbooks which

explain many aspects of electronics to people who haven't a clue - Eric Lindsay says the books are excellent value.

106-125

Popular Systems

Individual columns devoted to the more popular micros. This month's columns include Osborne, TRS-80, Hitachi, CP/M, Apple, VIC/C64 and our newest addition, Atari.

126 Classified Ads

Anything you want to buy, sell or swap is here.

next month

March YC will be a special computer graphics issue with articles on specific graphics packages and on trends in the graphics area.

We'll also be looking at a modem communication program written in G-Pascal for the Commodore 64; Evan McHugh passes on some historical tit-bits from the self-proclaimed "Father of The Microcomputer"; there'll be a whole new section full of pocket programs; if Les can repeat this month's admirable effort, dBase, Logic and Assembler tutorials will all appear for the second issue in a row; and, of course, we'll have the usual complement of news and reviews.



your computer

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editorial

At last, it's 1984, and George Orwell must be spinning in his grave at the misuse of his novel of that name. As I write this, early in January, I am moved to comment on how the commonly held views of 1984 have been completely wrong and also right.

For years, the popular press has looked upon computers as the tool by which a totalitarian state could be achieved. The fact is that computers are largely irrelevant in this context. Those of us who own computers know how ludicrously simple-minded they are, posing no threat to anyone. And if you want proof of the ineffectiveness of large database systems, just look at the ease with which various crime figures bypass our Customs and Immigration computer systems, and slip out of the country undetected!

On the other hand, history abounds with examples of totalitarian states which were set up completely without the assistance of computers – the Russia of the 1920's and Germany in the 1930's provide examples from both Left and Right.

In our own field, personal computing has started to provide the people with the technology that previously was only available to governments. A personal computer is – second only to a printing press – the ideal tool for printing up revolutionary broadsheets, if anybody still does that kind of thing. And if you look at the code in Apple Logo, you may still find that it contains the message 'Resist the Draft!'

The personal computer is an ideal tool for community groups, reform groups and other political groups to organise themselves by maintaining membership lists, doing word processing, typesetting and other tasks. (Incidentally, I note many people who bleat that technology is a weapon for governments are either unable or unwilling to use the technology that is available to them to further their own aims). George Orwell would surely be pleased and relieved to see that his allegory had not come true.

In the personal computer industry, however, we do have our own Big Brother in the form of IBM. A considerable weight of opinion in the US holds that Big Blue is damaging the market in a number of ways.

First, a growing number of manufacturers, apparently believing in 'Better blue than dead', have elected to build machines compatible with Big Blue's. The results are hardly innovative, and are

a long way behind the leading edge of established technology. This has two effects.

We need new ideas: we need machine designers to come up with new features without being inhibited by the need for compatibility. Only new ideas lead to progress. How are the compatible manufacturers going to keep up with the new IBM XT/370, which is based on proprietary technology and looks to be a very significant product for the future?

The trend to compatibility has also made it easy for the Japanese to compete in the US market. At last, the Japanese know exactly what features to put into a computer to succeed in the US market: just make it a clone. Of course, Japan Inc. can manufacture a better quality product more cheaply than most US companies. By flying in IBM's slipstream, the US personal computer industry has revealed a soft underbelly to some lean and hungry invaders from the east.

The trend to compatibility hasn't done much for the consumer, either. IBM has provided a price 'umbrella' under which other manufacturers can shelter. While IBM refuses to cut prices, the other manufacturers don't have to to remain competitive.

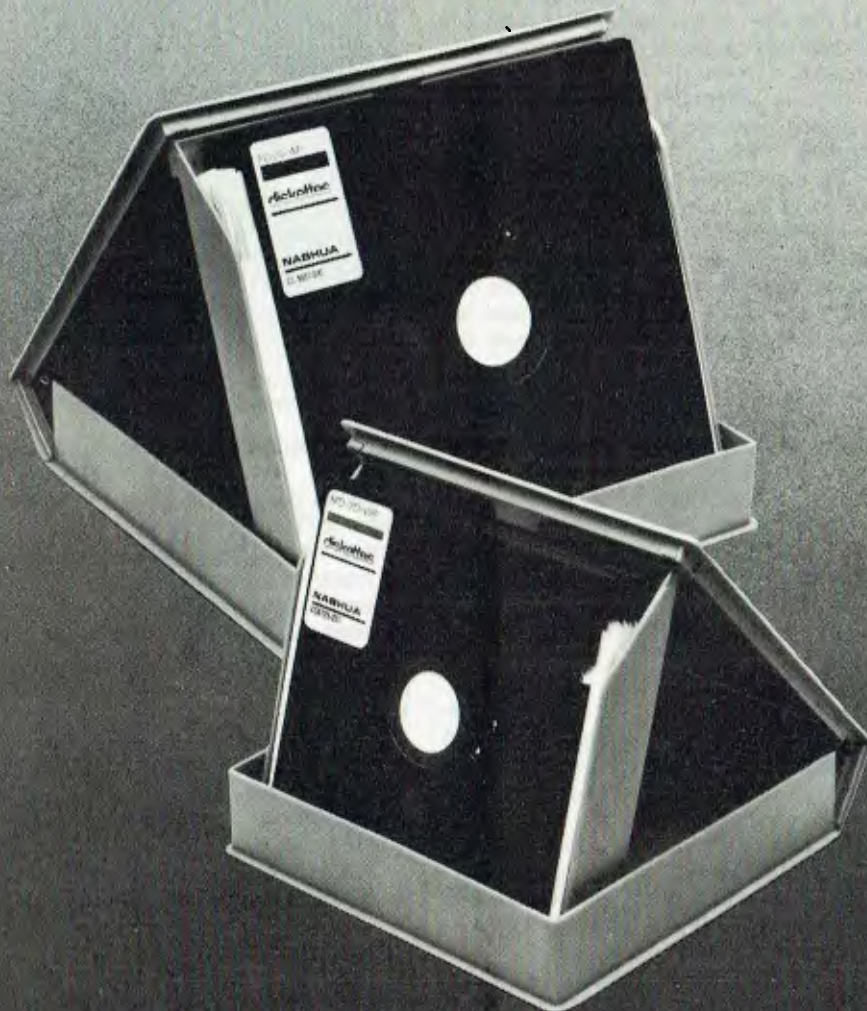
And, of course, the trend to compatibility doesn't do much for our own fledgling microcomputer industry. We can only compete in export markets by providing better products. Australia has engineering and software talent, not cheap manufacturing capability. If people don't want better products, but merely compatible products, we can't compete.

In summary, the situation can be partly blamed on IBM and partly on the exaggerated awe with which a large part of the industry holds the company. IBM is a great marketing organisation – but its microcomputer technology is no great shakes. Companies who copy its technology and ignore its marketing are going to be losers.

Talking about price umbrellas, we have to break some sad news. You've been standing under one for three years but, unfortunately, it's about to be raised. Yes, three years ago we launched YC with a cover price of just two dollars, and we've managed to hold it at that level ever since. Virtually nothing else has held its price for that long, but unfortunately we can't hold our breath any longer. Starting with this issue, we've had to put the price up to \$2.50 – but we're still the best value on the newsstands, and eager to stay that way.

— Les Bell

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your computer news

Microsoft Launches Window Software

THE 'SYSTEM USER AND MANAGEMENT' newsletter reports that Microsoft will soon launch the Microsoft Window with its MS-DOS operating system for personal computers.

Microsoft Window is designed as a software management program that controls the manner in which an application's program – such as those for word processing or spreadsheet calculation – is displayed to the user. It also possesses a variety of software tools for application program development and providing graphics for bit-mapped displays.

When a computer running Microsoft Windows is first switched on, each application program is represented by an icon or symbol at the bottom of the screen. To call up a program, the user positions the cursor over the desired icon, using a 'mouse', and pushes one of the mouse's buttons. The program will appear on the screen inside a window.

The size and location of a window can be altered by manipulating the mouse. Any number of application programs can be displayed simultaneously, and the user can alternate between application programs by moving the cursor with the mouse.

Zooming and other features are built in to the system, and existing MS-DOS application programs can be run, although most will not be able to take advantage of the windowing capability.

The hardware requirements for Microsoft Windows are 192K of RAM, a bit-mapped display, a mouse and two floppy disk drives. The system will be available for a range of 22 microcomputers during the second quarter of 1984. Enquiries should be directed to Microsoft on (02) 450 2522. □

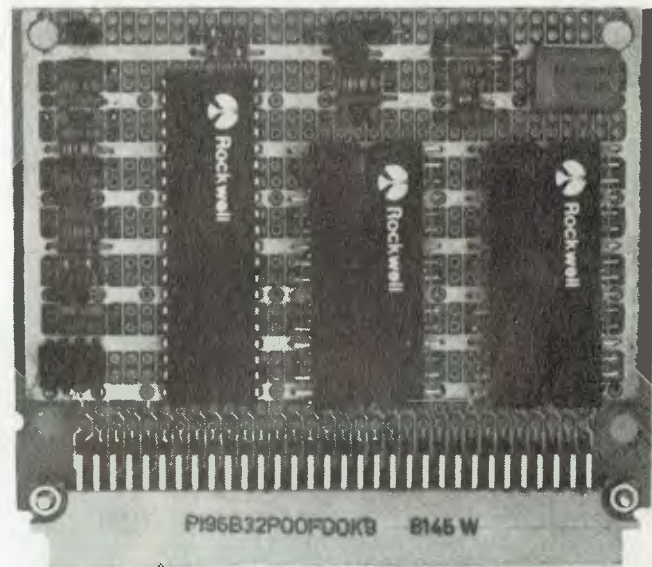
Modems Act Like Peripherals

ENERGY CONTROL plans to release a new range of LSI-based modems early in 1984. The family of 1200, 2400 and 9600 baud card-level modems are designed to be addressed as microcomputer peripherals and range in price from \$450 to \$750.

The R1212 (1200 baud) and R2424 (2400 baud) modems are intended for personal computers and have automatic originate and answer features. They are designed for remote and central-site computer applications and are available with circuitry for direct connection to phone lines.

The modem family derives from Rockwell-designed large-scale integrated circuits: two basic signal-processing devices with memory capacities that vary with performance. These chips are said to boost the modems into full-fledged computer peripherals, with control data transferred over the microcomputer bus.

The modems employ what the firm calls adaptive and fixed-compromise equaliser techniques, to ensure accurate transmission over even unconditioned telephone lines. These techniques involve continuous monitoring of transmitted signals,



A Rockwell-designed, large-scale integrated circuit used in Energy Control's new LSI-based modems.

and compensation for shifts in amplitude response and group delays.

Built-in diagnostics allow the computer to test the modems under local and remote loopback conditions. If line quality causes errors, the data can be re-transmitted under computer control at whatever rates are necessary.

Each modem requires 3.2 W at most, has software-selectable formats and meets applicable US and international communications standards. All devices in the line are hardware and plug-compatible, and are on circuit cards no larger than 100 mm by 160 mm.

Other modems in the range include the R96FAX (9600 baud), the R96DP (9600 baud) and the R48DP (4800 baud). The R96DP and R48DP are 'data pumps' for boxed modems or multiplexers. Another modem, the R96FT is a fast-train unit for multipoint systems.

For further information, contact Energy Control, PO Box 6502, Goodna 4300. Phone: (07) 288 2455.

Computer Literature

KNOWN FOR over 40 years as a source of technical information, the Technical Book and Magazine Company has opened a Computer Information Centre in its Swanston Street Shop, in Melbourne.

The Centre aims to cater to the needs of business people, educators, students, computer professionals and hobbyists – as well as the 'person in the street' who would like to know more about new technology, or who is considering the purchase of a personal computer. It will stock a huge range of computer books, magazines and software.



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Said Paul Radford, Managing Director of TB & M, "We're keen to create an area in which people interested in computers can browse through the latest publications in comfort." For further information phone (03) 663 3951. ☐



The Microsoft mouse.

A Mouse In The House

THE MICROSOFT mouse, suitable for use with the IBM-PC and other MS-DOS-based personal computers, is now available in Australia. Priced at \$195, it comes with three application programs that help the user learn how to effectively use the mouse and is available from all Microsoft authorised dealers.

The Microsoft Mouse is used to quickly move or reposition a cursor on the screen in order to insert, delete or reposition blocks of text within a document, without having to use the keyboard.

When the user moves the mouse across a flat surface, the cursor will track across a screen. No special prepared surface is required. Two buttons are provided to select decision alternatives or commands from the screen.

Microsoft has also introduced the Multi-Tool Word writing system software package, which is the first mouse-based

application program to be released for MS-DOS-based 16-bit microcomputers. Multi-Tool Word is a second generation writing system designed to ease the process of generating text documents for business applications.

There are several different pointing-devices available for use with the new generation of applications software. The mouse is said to be superior to devices such as digitiser pads, light pens and track balls for a number of reasons: mice have a superior dynamic range, in which they can move rapidly over a large screen with enough precision to allow for easy selection of characters; mice can be used with any CRT screen without obscuring the item to be selected; mice are small (you knew that?) and don't take up much room on the desk.

For further information, contact Microsoft, PO Box 98, Terrey Hills 2064. Phone: (02) 450 2522. ☐

Dick Says No

WITH REGARD to our article entitled 'Dick Challenges IBM', in the December 1983 issue of *Your Computer*: Dick Smith has refuted any suggestion that the new Challenger computer will be sold through Woolworths stores. ☐

Data '84

DATA '84, a business and personal computer show, will be held on May 22-24 at Sydney's Centrepoin complex.

Products from more than 1000 companies from all over the world will be on exhibit, and the larger participants include IBM, Control Data, Nashua, Sharp, Sanyo, DEC, Apple, NEC, Adler, Hewlett-Packard, General Electric, Commodore, Mitsui, Telecom, OTC and President.

The show covers a wide range of computer hardware, software and support services. It will feature specialised software packages for real estate, law and insurance; computer stationary and furniture; security equipment; and video and satellite systems.

For further information, contact Hartley Henderson, Graphic Directions, 8th Floor, 28 Foveaux Street, Surry Hills 2010. Phone: (02) 212 4199. ☐

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Kidney disease is the silent killer in Australia today. It may be present without apparent symptoms — & hundreds of Australians die of it every year.

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Foundation provides research & education programmes to both the general public and the medical profession. As well as life-giving aid to thousands of ordinary Australians.

We need urgent financial support to continue our work — and we need kidney donors.

For more information, ring the number below. Any donation of \$2 or over is tax deductible and bequests, endowments and legacies are exempt from State & Federal Estate duties.

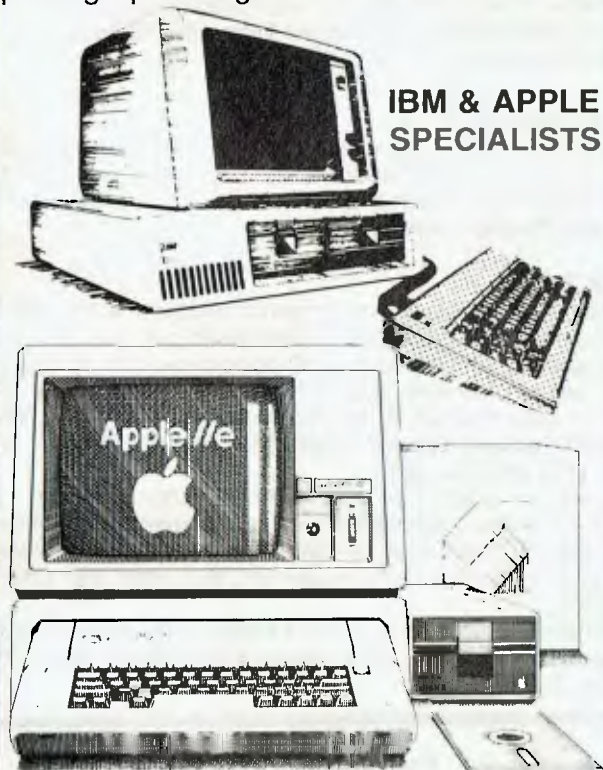
Remember, as someone has so rightly pointed out — the life you could help to save could be your own.

**The Australian Kidney Foundation,
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Oscwell's PONY Thermal Printer.

New Thermal Printer Breaks \$200 Barrier.

A NEW thermal 40-column computer printer capable of graphics is being released in Australia by Oscwell.

An ideal WP drafting printer, the PONY Thermal Printer is available with RS232 and Centronics interfaces, as well as specialist Atari and Commodore interfaces.

Weighing only 1.8 kg and measuring 26 x 19 x 10 cm the PONY printer costs \$166 (sales tax included), with prices ranging between \$20 and \$40 for the interfaces.

Operating at a speed of two lines per second (120 lines per minute) and 40 characters per line, this quiet printer is marketed as being suitable for the office, home, or laboratory environment.

The print control electronics are contained in the printer housing, and all interface control and character generation is contained within the plug-in interface module.

The character matrix and specific character sets are also determined by the plug-in interface module.

The PONY can produce good quality dot graphics, suitable for boardroom presentations or classroom visuals.

For further information contact, Oscwell International Australia, 271 Blackburn Road, Mt. Waverley 3149. Phone: (03) 233 3716. ☐

Applications Aids

The Apple Workbench is a series of technical products designed to help developers create applications for Apple Computers.

The first group of Workbench products consists of six software packages for the Apple II and Apple III computers: the DOS Programmer's Tool Kit; the ProDOS Technical Reference Manual; the ProDOS Assembler Tools Package; Apple Pascal Numerics; the Apple III Pascal Tool Kit; and Pronto - The Apple III Pascal Debugger. These packages are aimed at technically-skilled developers who require little or no tutorial information.

Finally, Apple has announced a mouse for the Apple II range of computers and new software called MousePaint. The mouse is a pointing device which can be used instead of a keyboard to select computer operations and modify information displayed on the screen, while MousePaint uses the mouse to design charts, diagrams, free-hand drawings and other visual aids for reports and presentations.

All these new products should be available in Australia during the first quarter of 1984. For further information, phone Apple Computer on (02) 888 5888. ☐

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■ Educational microcomputer software, developed at the Angle Park Computing Centre, is now available throughout the country. The software packages range in price from \$25 to \$50, with quantity discounts available. Further details are available from Angle Park Computing Centre, Trafford Street, Angle Park 5010, or by phoning (08) 268-5666.

■ Lotus 1-2-3 has been released for the DEC Rainbow series of personal computers. It is priced at \$895 and requires a Rainbow personal computer running the MS-DOS V2 operating system, and with a minimum of 256 K of memory and either monochrome or colour graphics. For further information, contact Marion Rhyderch, DEC Australia, Chatswood Plaza, Chatswood 2067. Phone (02) 412 5252.

■ An Open Day will be held by the Melbourne Super 80 Users Group at the Uniting Church Hall, 83 Canterbury Road, Heathmont on March 17. Prospective members, and the curious, can see displays of Super 80s and associated hardware from 9 a.m. to 4 p.m. For further information, write to 17 Stephen Crescent, Croydon 3136, or phone (03) 723-2713.

■ An IEEE-488 interface for the DEC Rainbow 100 has been released by National Instruments. It will allow the Rainbow 100 to access over 2000 instruments, peripherals and other computers. For further information, contact Elmeasco Instruments, PO Box 30, Concord 2137. Phone (02) 736-2888.

■ Polaroid Corporation plans to enter the floppy disk market in the US early this year. Polaroid will develop high quality 20 cm, 13 cm and sub 10 cm floppy disk media. These will be converted into finished disks by Permabyte Magnetics, and distributed in the US and selected overseas markets by Polaroid and Perfectdata Corporation.

■ Microsoft MS-DOS and Digital Research CP/M-86 will be standard on the 16-bit NEC Advanced Personal Computer. The systems

will be included free, a saving of \$350 on the price of an APC.

■ VIC 20 and Commodore 64 owners can pick up a free game with every Computer Classics game they buy. VIC 20 owners can get a copy of Galactic Defender and Commodore owners can get Stratagem simply by filling out the Free Game Offer card inside a Computer Classics game pack.

■ A free newsletter designed as a forum on computer education for Australian teachers has been launched by Apple Computer. Although new hardware and software will be detailed in each two-monthly issue, the emphasis will be on exchange of information between computer users in education. Contacts for further information are Mike Buchanan or Vicki Staveacre at Burson-Marsteller on (02) 241-3016.

■ ATAC Dataprocessing has been made distributor of the Microtec range of software development tools. The Microtec range includes Assemblers/Simulators for the Intel, Fairchild, Motorola, Mostek and Zilog range, including all current 16-bit and 16/32-bit devices. All development tools run on DEC PDP-11 and VAX-11, and can be ordered complete with source code. Contact ATAC on (02) 436-4277.

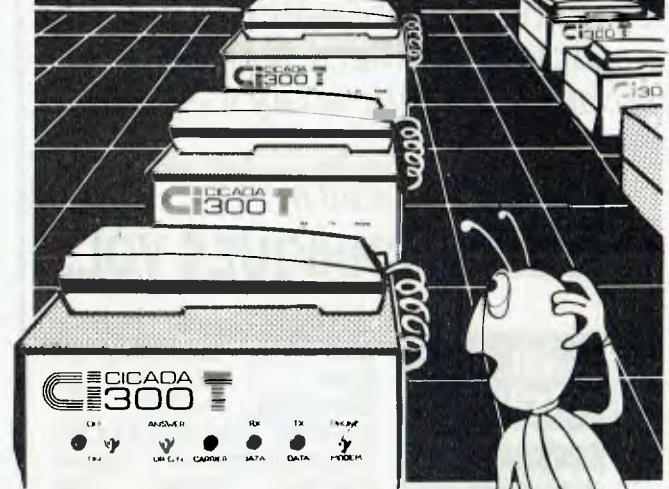
■ Computer Classics has released three packages for people who want to learn Assembly language programming. Each package consists of a book and cassette, and will teach Assembly on the VIC 20, Commodore 64 and BBC micro. The packages are beginners courses covering machine-language concepts and assembler programming. Contact Gerry Gerlach at Computer Classics, 11-15 Falcon Street, Crows Nest 2065. Phone (02) 438-4866.

■ The Co-op Bookshop has obtained all outstanding stocks of TI 99/4A reference books in Australia. The books are now available at considerable discounts. A full list of titles is available from every branch. For further information, contact Jon Ruvolt on (02) 212-2211. □

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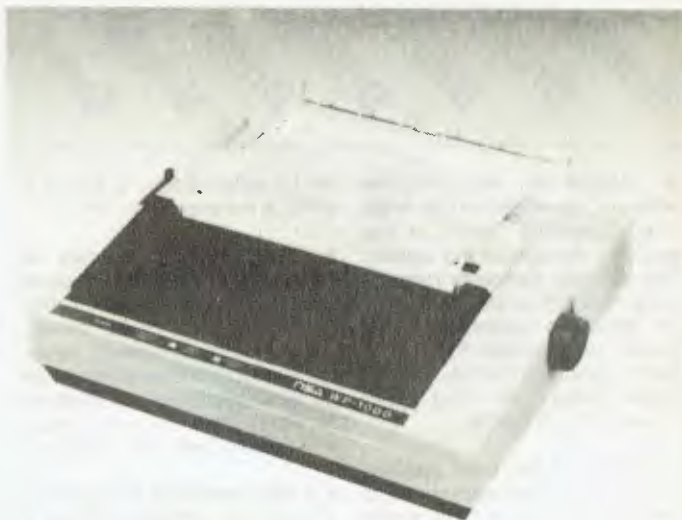
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NSA's dot matrix printer for personal computers.

Copal Printers From Japan

NSA COMPUTERS, a division of the Nissei Sangyo Company of Japan, recently announced their decision to market the full range of Copal printers in Australia.

NSA has been selling computers and peripheral equipment through local distributors for a few years and the initial release of the WP-1000 proved so successful that Nissei has decided to market the entire range.

The WP-1000 is a dot matrix printer for use with personal computers. It is equipped with both parallel interface (Centronics) and serial interface (EIA RS232C), an easily detachable print head and adjustable pin feed tractors. It accepts fan-fold paper, roll paper and cut paper and prints in 9 by 11 dot matrix. Twelve character variations may be used within the same line, including graphics printing.

Other features include high through-put with bi-directional logic seeking and a maximum of 28 cm of paper back-feeding, with a minimum control pitch of 0.35 mm.

For further information, contact NSA Computers, 200 Pacific Highway, Crows Nest 2065. Phone: (02) 923 1522. ☐

Office Automation '84

THE FIRST major Australian office automation conference and related exhibition, promoted as Office Automation '84, will be held from June 12 to 15 at the Royal Exhibition Buildings, Melbourne.

The exhibition will encompass all facets of operating an automated office and hopes to meet the growing demand of corporations, governments and general business enterprises.

Topics scheduled for the main conference include: Corporate Approach to Office Automation; Preparation and Implementation of a Corporate Network; The Problems of Managing the Transition to an Automated Office Environment; The Technologies and Cost Involvement; Bridging the Gap of the Automated Office Concept with Personal Needs of Management; The Realities of Local Area Networking in Australia; Word Processing in Australia; Word Processing and the Automated Office; and The Professional Secretary's Role in Management of Information.

Organisations involved in sponsoring and conducting the conference are the Institute of Chartered Secretaries and the International Information Word Processing Association.

Commercial organisations interested in participating in Office Automation '84 should write to Office Automation '84, PO Box 259, Roseville 2069. ☐ ►

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TRADE ENQUIRIES WELCOME.



DEC's VT240 terminal has bit-map graphics capabilities for business applications.

New Equipment From Digital

DIGITAL Equipment Corporation has released a new range of video display terminals and two new VAX-11 software graphics packages.

Designed particularly for the business environment, the new VT200 terminal series has three models, claimed to be user-friendly and with such features as advanced text handling and colour graphics capabilities. Possible applications include data entry, office automation, electronic mail, interactive computing communications, networking and business graphics.

The VT220 retails for \$1,818 (all prices quoted here do not include duty or sales tax). A monochromatic text unit, it consists of an ergonomically-styled keyboard and a 30 cm, non-glare monitor with a choice of white, green or amber screen.

The VT240 retails for \$3,082 and has all the features of the VT220, plus bit-map graphics capabilities for business graphics applications. The terminal supports two high-level graphics instruction sets: Digital's Remote Graphics Instruction Set and Tektronix 4010/4014 protocols. It comprises a monitor, keyboard and system box which contains the terminal's logic. Digital provides applications software – such as the DECgraph and DECslide packages – to support the graphics features of the VT240. A large number of commercial applications packages are also being developed by major third-party vendors.

The VT241, which retails for \$3,742, has the text and

graphics features of the VT240, with the addition of colour display. There is also colour (red/green/blue) output to devices such as a colour camera or auxiliary colour monitor.

New features common to all three terminals include: reverse video and character highlighting; independent adjustment for character brightness and screen contrast; a CRT 'saver' function which blanks the screen if the same image is displayed for over 30 minutes – this extends tube life, and any single keystroke recalls the blanked image; special function keys are host-programmable; and all VT200 terminals have a printer port EIA and 20MA communications interfaces.

The VT200 terminals have full VT100 emulation capabilities, to enable customers to add VT200s to systems currently supporting VT100 terminals.

DECgraph and DECslide, the new VAX-11 graphics packages are designed for use with the new video terminals VT240 and VT241.

DECgraph allows users with no previous computer-aided graphing experience to design, modify, print and display presentation-quality graphs. Special symbols, called icons, enable simple selection of available design and option choices. Selection of an icon creates one of six basic graphs: line, scatter, cluster bar, stacked bar, histogram or pie chart. Beyond these basics, a variety of enhancements are developed in the same way.

DECslide is a text and design, shapes-generating software package developed for professional and business users with little or no computer expertise. Simple commands and icons allow the user to create presentation quality illustrations. For example, when the user selects the 'design' icon, an on-line menu offers the choice of a line, a triangle, a polygon, an arc, a circle or a box, all of which can be modified as well as filled or shaded. Diagrams and/or text can be saved in a library, for use in a number of different presentations. Two slides can be merged to create a third illustration. A frequently used slide (or part thereof) such as a company logo, can be overlaid onto another slide.

DECslide and DECgraph can either operate as independent tools or can be integrated with Digital's office automation product, ALL-IN-1.

For further information contact Marion Rhydderch on (02) 412 5252.

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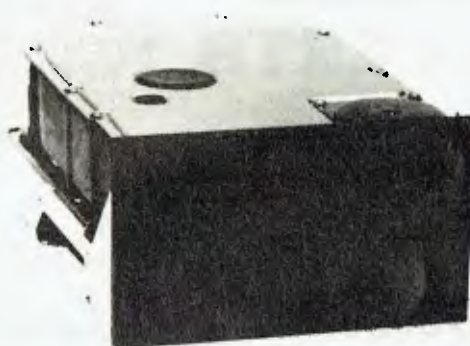
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Tandon's low cost 5¼" rigid disk drive features an on-board microprocessor which calculates the optimum positioning algorithm, yielding an Average Access Time of 110 milliseconds. This product family includes 1, 2, and 3 platter models with unformatted capacities of 6.4, 12.8, and 19.1 megabytes, respectively.

Up to four Tandon TM500's can be daisy-chained on a single bus, which provides a capability of up to 76 megabytes of on-line storage (unformatted) in a single system.

These drives are compatible with controllers that use an industry standard interface (ST 506).



Tandon Model TM-100 Mini-Floppy Disk Drives

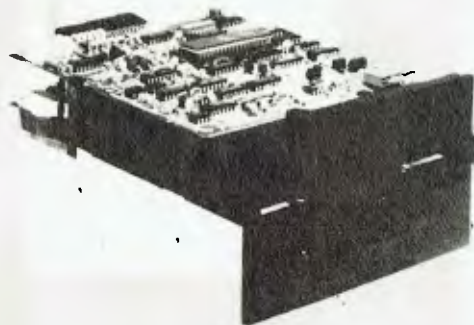
Tandon's TM-100 family of mini-floppies offer the absolute highest storage capabilities of any 5¼" high-speed, random access disk drive available in two single head and two double head models, all double density.

Unsurpassed Storage Capacity—Up to an incredible 1000K bytes information on 160 tracks. Recording density is 5877 BPI.

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Australian Disassembler for the Apple II

LATCO, a local computer consultancy, has developed a powerful software package which enables the user to disassemble (and thereby translate) 6502 object code (machine code) into source code.

Working with the DOS Toolkit 6502 Editor Assembler for the Apple II, Disappler enables the user to reassemble, edit or customise machine code programs.

Murray Baker, Managing Director of Latco, believes that the average Apple II enthusiast is at present trapped in a limited world of BASIC programming.

"The average enthusiast quickly runs out of enthusiasm when his inquisitive drive is limited in this way", says Murray.

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"Disappler will allow enthusiasts to examine operating systems, device drivers, software languages and even game software. Half the fun is learning other peoples tricks! Disappler gives inquisitive people a terrific learning opportunity."

Enquiries should be directed to Murray Baker, Latco Pty Ltd, PO Box 267, Cremorne Junction, 2090. Phone: (02) 905 462

Tandy Lowers TRS-80 Prices

TANDY has reduced prices on a wide range of TRS-80 business computers.

This decision was prompted by the current lower production costs for these items – the result of Tandy's own manufacturing, distribution and retailing networks, the continued refinement of production techniques and longer and larger production runs.

The new prices are: TRS-80 8K Model 100 (26-3801) – \$899 (formerly \$1099); TRS-80 24K Model 100 (26-3802) – \$1099 (formerly \$1399); TRS-80 16K Model 4 (26-1067) – \$1499 (formerly \$1799); TRS-80 64K Single Disk Drive Model 4 (26-1068) – \$2499 (formerly \$2799); TRS-80 16K Double Disk Drive Model 4 (26-1069) – \$2999 (formerly \$3299); TRS-80 Single Disk Drive Model 12 (26-4004) – \$4499 (formerly \$5499); TRS-80 Double Disk Drive Model 12 (26-4005) – \$5699 (formerly \$6999); TRS-80 Single Disk Drive Model 16 (26-6001) – \$6699 (formerly \$8499); TRS-90 Double Disk Drive Model 16 (26-6002) – \$7999 (formerly \$9999); TRS-80 DT-1 Data Terminal (26-6050) – \$1299 (formerly \$1499).

In addition, most accessories and expansion kits used with these items have also been reduced.

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New From Adaptive Electronics

ADAPTIVE ELECTRONICS has announced a clutch of new products.

The C-10MP Personal Computer is a new system which utilises both C-10 hardware, and software developed by Cromemco and MicroPro International software. The MicroPro packages included with the C-10MP are WordStar, InfoStar, CalcStar and MailMerge; those from Cromemco are WriteMaster, PlanMaster, MoneyMaster, Structured BASIC and the CDOS Operating System. Software conversion kits (Model MPS) which transform C-10SP machines into C-10MPs are also available.

The Model CKBC is an expanded keyboard designed to extend the functionality of Cromemco systems by providing a Selectric-style layout and a numeric pad. The Model CKBC has 20 dedicated function keys which use normal and shifted codes to generate 40 special function codes. The first of these keyboards are expected to be available in February or March 1984.

The new Catalogue of Systems Products is available immediately.

In the United States, Cromemco has introduced a new version of the 68000 Cromix operating system, which can support more users on a Cromemco D-Series system with expanded shell buffers and process tables. The new Cromix version 20.52 is a UNIX-like system with a device driver that allows RAM to act like a disk drive.

Also in the United States, Cromemco has introduced a new colour graphics interface that digitises images from a television camera or other video source.

For further information contact Adaptive Electronics, 418 St.

Kilda Road, Melbourne 3004. Phone: (03) 267 6800. ☐

Fresh From Apple

APPLE HAS ANNOUNCED a bushel of new products...

First, the most-used productivity tools utilised by personal computer owners – financial modelling functions, word processing and database management – have been integrated into single programs for both Apple IIe and Apple III computers. Called AppleWorks (for the IIe) and III E-Z Pieces (for the Apple III), both packages offer three levels of integration and allow users to move information among files within an application, or to a word processing file, using cut-and-paste functions. AppleWorks requires an Apple IIe personal computer with 80-column card, one floppy disk drive and a monitor, while III E-Z Pieces requires an Apple III computer system with 256K of internal memory. Both packages will be available in the first quarter of 1984.

For business users of the Apple II, Apple has released ProDOS software and a revised Apple Pascal Development System, which will allow them to use ProFile (Apples Winchester-technology disk drive). ProFile gives the Apple II a storage capacity equivalent to 35 floppy diskettes, with retrieval said to be ten times faster than a conventional floppy disk.

For use with Apple II, IIe and IIe Plus computers – incorporating 64K or more of memory – ProFile is packaged with BackUp II software, which allows all stored files to be transferred to back-up floppies for storage.

All Profile purchasers receive an interface card, to connect ProFile to one of the computer's expansion slots, and a software utility, to manage Pascal files on ProFile. ☐

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A New Lisa Life for Apple



It's a year since Lisa leapt upon the scene, a year during which the vast majority of the population has not bought Lisas — mostly because of price, says Les Bell. Here's what they've been waiting for.

THE EVOLUTION OF easy-to-use, graphics-driven systems which emulate a desk-top has not been a simple one. First, there were the various Xerox PARC systems — the Alto, the Star and others. Xerox never quite got its act together there, despite some astonishingly good ideas and a vast research and development budget — perhaps the marketing people could not believe their ears.

Last year, Apple brought out the first such system to achieve commercial success: Lisa. Lisa has been a mixed success. Everyone agrees the concept is terrific, the execution good, but "oh, the price?". At over \$10,000, Lisa is not for everyone.

Now, Apple has continued to bring user-friendly computing to the people with the release of Macintosh, a machine that does many of the same

things as Lisa, but for a lot less money.

Macintosh is a compact little fella. At around 25 cm square at the base and perhaps 38 cm tall, he's shaped differently from most personal computers. The idea is, obviously, to minimise wasted desk space. The keyboard is a compact version of Lisa's, minus the numeric pad. An optional numeric pad can be attached.

Being compact not only minimises the



The MacPac is an optional carry bag which holds the Mac, and its keyboard cables, disks and other paraphernalia.

waste of desk space, it also lends itself to transportability. An optional carrying bag holds the Mac, upended keyboard, cables, disks and other paraphernalia. While the package is light enough to be carried by its two handles, there's also a shoulder strap which would be more comfortable over long distances (like the length of the car park).

Most of the front of Macintosh is taken up by the screen, a 23-centimetre high-contrast black and white type which looks like Lisa's. The display is capable of displaying 512 x 342 pixels compared with Lisa's 720 x 364, though at first glance the two are almost identical. One major difference is that Macintosh's pixels are truly square, whereas Lisa's are rectangular, causing distortion when printed.

I'm writing this on my Lisa just after working on Macintosh, and there's no doubt that the Lisa display is finer – but for the difference in price, I could be persuaded to compromise! For the most part, however, the screens are the same. If anything, the Macintosh team have had more fun with icons and other screen symbols. An icon, by the way, is a small graphic symbol which represents some object such as a file or a floppy disk.

Below the display is an 89 mm (3.5 inch) micro-floppy disk drive. This has some advantages over the previous generation 13 cm floppy. First, it's more rugged, with an automatic cover. Second, it can be fitted into a shirt pocket. The drive takes up less space, too. Disk

capacity is 420K, which is quite reasonable.

Beside Macintosh's keyboard you'll always find a mouse which can be used to point to objects such as icons and windows. This is how the system works, with almost no need for the keyboard. To open a file, you simply point to it and click the mouse; to open a folder, which can contain multiple files, you do the same thing.

At the back of the machine, there's the power connector and on/off switch (obviously), plus some other interesting things. There's the mouse connector, of course (the keyboard connector is at the front). There are also an expansion disk connector, two RS-422 ports (for printer

and modem/network), a sound output and, on the prototype I saw, an external video output. Production machines are not expected to have this. The reset button is also at the back.

The whole machine is a sealed unit. There are no expansion slots inside and no reason for the user to open it. In fact, the intention is that production machines will have a sealed or encapsulated circuit board.

For those who are curious about how the tricks are performed, here's the innards: a Motorola MC68000 processor running at 8 MHz has 64K of ROM and 128K of RAM. Also on the board are a DMA disk controller and sound generator, video circuitry and the other



Beside Macintosh's keyboard, you'll always find a mouse.

interfaces. There's a real-time clock, which can be displayed and is also used for date-stamping files.

Driver's Seat

From the user's point of view, Macintosh is probably the simplest computer to use. Like Lisa, it displays a floppy disk on the screen as an icon. By clicking on the icon, the user opens the disk to reveal a window showing the icons for the various files and folders on the disk (folders are simply directories which can contain other files).

Moving the mouse to one of these icons and clicking twice will open the file and invoke the appropriate applications program to display it. Double-clicking on the icon for one of the applications will run the program and create an unnamed blank file.

Across the top of the screen is a menu bar from which entries can be selected by the mouse. Selecting a menu bar item causes a blind to drop with sub-menu choices. These are selected by dragging the mouse downwards and releasing it when the appropriate choice is highlighted. Exactly like Lisa.

Files are closed either by selecting the 'Close' option from the menu bar or by clicking on the icon in the corner of the application's window (here Lisa requires a rather redundant double-click). Once files have been closed, the 'Eject' option becomes possible, releasing the disk.

The major difference between Macintosh and Lisa lies in the operating systems. Lisa supports multiple tasks concurrently, so that two applications can co-exist on the screen and you can instantly switch between them – particularly useful for cutting and pasting material between applications.

Macintosh, on the other hand, is a single-tasking machine – you can only run one program at a time (though other things can happen in the background, like the clock ticking and disk transfers). Thus, to transfer data between applications, you must finish working with one program and save the data to a file called 'Scrap'. This is not a real file, merely an area of memory, so it does not disappear when you change disks. You can then load the next application from 'Scrap', transferring the data.

Applications

Four applications will be available initially. At the time of writing, the names had not been finalised, but they are likely to be MacWrite, a word processing program; MacPaint, a drawing program; and MacPlan and MacChart, which are spreadsheet and graphing programs (respectively) from Microsoft.



MacWrite is similar to the LisaWrite program: it allows you to pick from several type styles and sizes, ranging from gothic to futuristic. Editing is performed with the mouse by dragging through text to select it and overtype, copy or cut it. There is little to learn about using this kind of editor. It takes longer to describe than to show, and probably longer to describe than to learn.

Parameters, such as centering, justification, tab stops and so on, are selected from icons at the top of the window, rather than by commands embedded in the text. This is extremely simple to use; just click the mouse on top of the picture which shows how you'd like your document to look.

It is even possible to integrate graphics into MacWrite documents, something that is not possible with Lisa (sob,sob!).

MacPaint is considerably more advanced than LisaDraw in many respects. It uses the same basic method of operation: select from the palette for what you want to draw, select line thickness and fill shading, and draw. However, MacPaint adds some new concepts.

You can pick a brush and adjust the shape of its tip, after the fashion of the nib of a pen, as well as the shade it will draw with. There are brushes with gaps in them, so a pattern can be gradually built up with repeated brushstrokes.

Similarly, there's an aerosol spray-paint can which allows a shade to be gradually applied. This enables you to shade areas to reflect height, shadows or whatever. The MacPaint screen is a

bit-mapped area, and the program lets you zoom in on an area and set or reset the bits individually. The same technique can be applied to any of the shades, to allow the creation of new patterns.

MacPlan is (surprise, surprise) based on MultiPlan, though with a different user interface. Cells are selected by clicking on them with the mouse, and commands are selected from the menu bar at the top of the screen. Its capabilities are similar to the generic versions of MultiPlan, but it is different to use.

MacChart had not arrived in the country when I looked at Macintosh, so I can't comment on it, except to say that it has impressive capabilities compared to most charting programs – as one would expect, judging by the Macintosh display and general philosophy of operation.

Macintosh is very fast in operation, due to its 68000 processor. This is shown by two of its demonstration programs. One, a game called Alice, is a real-time animated graphics game which shows chess pieces moving around a board in a full three-quarter perspective view. All the pieces are detailed, including an Alice who looks very like Tenniel's original illustration, and boy, do they move fast!

In the Amazing maze game, Macintosh draws incredibly complex mazes and updates them throughout the game with surprising speed. Though Apple describes the machine as 'the appliance for every desktop', it is also a games machine *par excellence*. ►

For those who want to write their own programs, two programming languages will be available almost immediately after release: Instant Pascal and BASIC.

Instant Pascal is an excellent learning tool. Each program has two windows, one containing the program source code and the other for program I/O. Once the source has been entered, selecting 'Go' from a menu blind compiles and runs the program (or maybe it's interpreted). The output from the program appears in the output window.

Most impressively, if there's a bug, the source window will display the errant line with a pointing finger next to it. You can even step line-by-line through the program, and the moving finger will point to each line in succession!

BASIC is similar. Here, the source code is entered into one window, and when the program is run, a new window appears on top to handle the I/O. Separate windows can be created for successive runs, allowing comparison. Neat, huh?

Other languages are expected in due course from other software developers; C and FORTH among them.

The Ghost in the Machine

For those who are curious about the operating software that makes the machine go, here are a few details. The operating system itself does not seem to have a name, but generally, the routines in the 64K of ROM which handle the user interface are called the Toolbox. The code inside the ROM is extensively hand-optimised to shoe-horn as much as possible into it. To illustrate how much is in there, consider the fact that there are over 480 operating system calls!

The major portion of the ROM — around 22K — contains Bill Atkinson's QuickDraw program, which handles the screen. Atkinson was rash enough to say early in the project that given long enough, he reckoned he could squeeze the program into 22K, so the Macintosh team set him the task (he seemed to have enough spare time to write MacPaint, though!). QuickDraw is fast. It is capable of drawing up to 1600 long horizontal lines per second, or 320 solid rectangles per second, a performance few other graphics subsystems could achieve.

The rest of the ROM contains various kinds of managers — the Memory Manager, Control Manager and others — each of which is responsible for some aspect of the system's operation, and in particular, the user interface.

For example, the Control Manager is responsible for various kinds of user controls and displays, such as buttons (place the mouse and click to select some action), thermometers, scroll bars,



analogue dials and others. The Memory Manager moves objects around within memory. Incidentally, most programs are relocatable.

Programs are separate from any prompts, menus or messages, and other

normally embedded data; instead they are in Resource files, to minimise the amount of precious memory used. As you'll appreciate by now, 128 Kbytes of RAM is not much to hold all this code. For that reason, some programs are split up into

Specifications and Report Card

Unit:	Macintosh
Made by:	Apple Computer Inc.
Processor:	Motorola MC6800
Clock speed:	8 MHz
RAM:	128 Kbytes
ROM:	64 Kbytes
I/O:	2 x serial RS-422
Languages:	BASIC, Pascal
Keyboard:	58-key, 2-key rollover, optional external numeric pad
Display:	Hi-res 512 x 342 bit-mapped
Graphics:	Yes
Peripherals:	Dot matrix printer
Expansion:	Memory upgrade to 512 Kbyte, second disk drive
Best points:	Mouse-icon operation, speed
Worst points:	Not multi-tasking

Ratings:	excellent	very good	good	poor
Documentation:	Not seen			
Ease of use:	●			
Functionality:	●			
Support:	●			
Value for money:	●			

Extras included:	N/A
Options:	N/A
Price:	\$ N/A
Review unit from:	Apple Computer Australia

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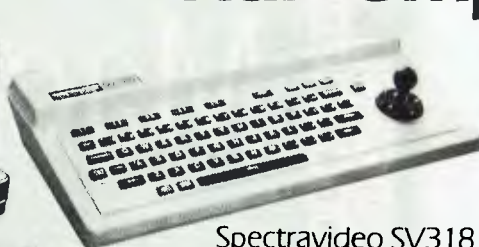
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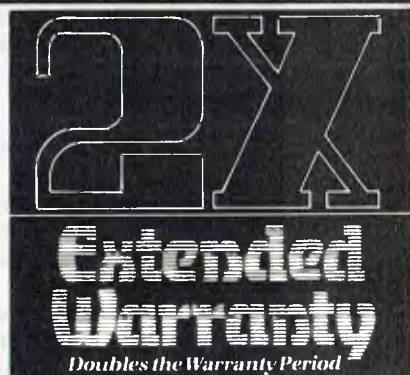
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overlays, and occasionally you will notice the disk drive whirring as Mac loads an unusual font.

Most of the hard work of handling graphics and the user interface has already been done by the Apple team and is inside the Macintosh ROM. This has two benefits: it means less work for the applications programmer, and it also means most applications will conform to the standard user interface style, since that is the path of least resistance.

The higher-level systems software, and the applications themselves, are written in Pascal (they are at Apple – Microsoft probably uses C). Systems software includes the Desktop Manager, which opens and closes icons and generally allows the screen to look like a desktop, and the Finder, which is the file management system.

Getting It Together

Talking about applications, what else can we expect for Macintosh? Many software houses already have Macs and Lisas and are working on software.

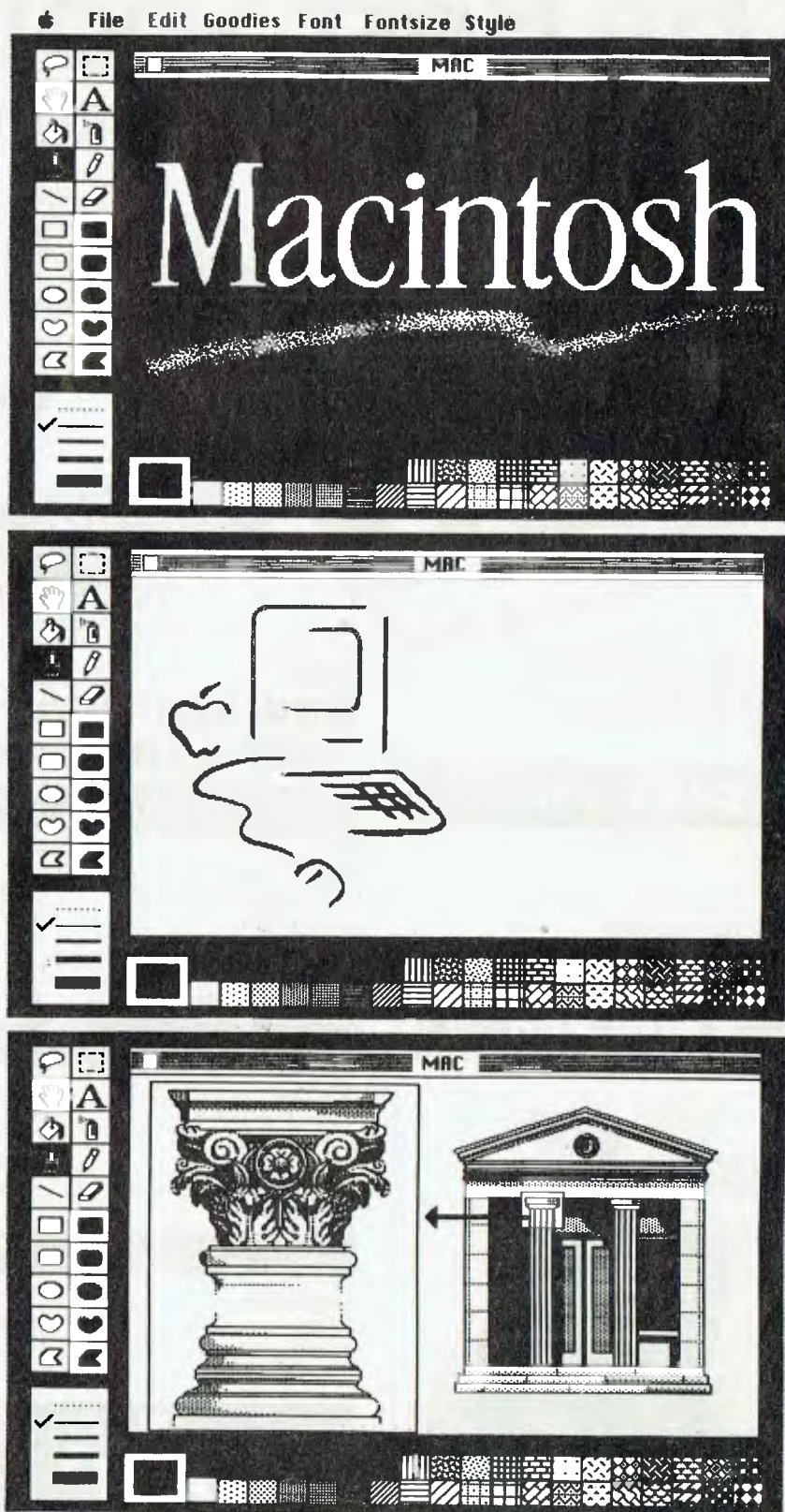
For example, Lotus 1-2-3 will soon be available on the Macintosh. While it's already a very nice program to use, on Mac it will really be special. In addition, the PFS products are being converted for Mac, and a number of Microsoft products will be announced for it. Apple estimate that by the end of 1984 there will be over 500 software products available for the machine.

Apple's software people are also working on goodies for Mac. For example, Mac has a four-channel D/A converter attached to the sound port, driven by DMA and with a sound channel interrupt occurring every 44 microseconds. Apple has a program called SoundLab which can display four waveforms in separate windows while simultaneously playing them through the speaker. Each channel has adjustable tone, volume and pitch, allowing music to be played.

In addition, Mac has also been used to digitise speech and play it back through the speaker, although this chews through memory at a great rate.

I've saved the best part for last. After the descriptions and glowing testimonials above, you might think Macintosh will cost you an arm and a leg. Not at all.

Exact pricing has not been set for Macintosh yet. It largely depends on the performance of the new highly automated factory where the machines will be assembled. However, the US price will be somewhere between US\$2,000 and US\$3,000 – it oscillates from day to day. This translates into an Australian price somewhat higher, of course, but



Some examples of Mac's graphics capabilities.

still around \$3,000 which is a lot less than most of the industry is probably expecting.

After spending a day with Macintosh, I'm impressed. It's a whole new flavour

of personal computer; one geared towards productivity and ease of use. It's certainly the top-performing personal computer under \$5,000 on the Australian market. ►

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Apple's New Range

IT'S HARD TO BELIEVE today that Apple Computer Inc started out as two guys in a garage, with capital raised by selling an HP calculator and a VW Kombi van. Apple is virtually the American Dream incarnate, the modern success story.

However, since the halcyon days of '77 and '78, the going has become a lot harder. There's more competition and more sophistication in the marketplace, plus technology is playing the part of a bucking bronco that's ever so hard to stay on.

Lisa represented an enormous leap forward in the application of graphics and software technology to personal computing. Macintosh consolidates Apple's position as technology leader here. But Apple's January new product announcement contains more than just Mac. There's something for everyone.

The Apple II is still a long way from the end of the road. It is being given a new lease on life by a couple of new products. First, there's the Profile hard disk which is now being announced for the IIe. Although other vendors have had hard disks for the II for years, this one is official. Its success or failure will depend on one major factor – the price.

For years I have complained that DOS 3.3 is not really an operating system, merely a set of disk access extensions to BASIC. At last, Apple are releasing what I hope will be a real operating system for the II, in the form of ProDOS. This is an adaptation of the Apple III SOS (Sophisticated Operating System), but specifically designed for the II. It is compatible at the system call level with DOS 3.3, and most programs written for that OS will continue to run under the new DOS. However, a number of software houses are revising their software to take advantage of ProDOS's features.

Also new for the IIe is a mouse. Apple seems to have been overcome with rodent mania of late, and are determined to put mice everywhere. A number of software packages will be released for the mouse, including MousePaint, which is similar to Macintosh's MacPaint, but with colour. Apple refers to 1984 as The Year of the Mouse, although technically it is the Year of the Rat.

While IBM's PC receives most of the attention from software developers working on integrated software packages, Apple has seen to it that the II is not ignored with the release of AppleWorks, an integrated spreadsheet package similar to Lotus 1-2-3.

Another very significant upgrade for the IIe is the ability to run MS-DOS, using an add-on board and a disk drive which is being produced for Apple by Rana, a manufacturer of Apple-compatible disk drives (a case of If You Can't Beat Them?). Apparently the standard Apple Disk II can't handle MS-DOS format – although CP/M was adaptable to it – and so it requires a new kind of disk drive. The package also includes a new processor card and memory.

At the top end of the Apple range, the Lisa is undergoing some revamping. The Lisa as known today will disappear, to be replaced by Lisa 2 (existing owners need not fear – they can upgrade). The major reason for the change is to provide

compatibility with the Macintosh's 9 cm disks, although it must be admitted that the 'Twiggy' drives used in the Lisa have not been a conspicuous success.

The new Lisa will have less memory, at only 512K, and a single micro-floppy drive. Because the Lisa operating system requires 750K at least to operate (multi-tasking, virtual memory, you see), the Lisa 2.0 will only be able to run the Macintosh software through an emulator program called MacAlike. It is intended that business users seeking to handle big spreadsheets will go for this machine as a kind of 'Big Mac' (groan!).

The next machine in the line will have an additional five-Mbyte Profile disk, while the top of the line will have an integrated ten-Mbyte hard disk. In both cases, additional memory will be required to run the Lisa software, although MacAlike can be used.

This means the Lisa/Macintosh line is really a family of machines – not just big sister and little brother (Big Sister is watching You?). In fact, Apple now sees two distinct product lines: the 6502 family, consisting of the II and III, and the 32-bit (I'd argue that) line of Lisa products.

The II is really aimed at the education and high-end home computer markets, where it has traditionally been strong. Although some business people did buy II's to run VisiCalc, it was never intended as a business machine, and that position – sitting on a desk – is now to be taken by Macintosh.

The machine that will probably be hit most by Macintosh is the III, which has been popping up on quite a few professional desk-tops. It will still retain its role as a good general-purpose business machine, however: Macintosh is not meant to run accounting software.

Lisa, of course, is still the top-line machine for the executive desk-top, particularly for that semi-mythical race, the Knowledge Workers. It now becomes much cheaper to own a Lisa at the entry level, though expanding it will probably work out to be about as expensive.

It's difficult to know whether this strategy will be effective for Apple, which is now positioning itself as the alternative to IBM. It is an alternative in image and management style, as well as an alternative in product directions. There's no doubt that the Lisa family represents a completely different style of working to IBM's PC-DOS, which still betrays its CP/M-clone origins.

Particularly in Australia, IBM's major successes have been in the corporate arena, where purchases are made by the company, not the individual, and often are controlled by the DP department. Apple's products have tended to be more personal, and have suffered as a result – DP Managers tend to feel comfortable with the traditional command-line approach, and perhaps threatened by Lisa's user-friendly style.

I define a personal computer as a machine of which it is possible to say, 'It's mine, it's mine, and you can't play with it'. By this definition, it's doubtful whether most of the IBM-PC's would qualify as personal computers. Often they are shared or have restrictions on the user's involvement. On the other hand, how many Lisas are truly personal computers – particularly with the associated price tag?

The big question is whether Apple's product range is now too broad. One reason Digital failed to wrest more of the market from IBM is that it had a range of three and a half products (Rainbow, DECMate II and the Pro's) compared to Big Blue's 'one size fits all' approach with the PC. On the other hand, IBM has itself started to broaden the product line, with the addition of the XT, XT/370 and the 3270 Personal Computer – all machines designed to appeal strongly to the corporate market and particularly IBM mainframe users.

It's going to be an interesting year. I hope Apple does well with Macintosh. It's an interesting and worthwhile product, and if it doesn't do well, we'll be left with no alternative to the CP/M/MS-DOS way of life, which has frankly lost a lot of its appeal for me. Such is life, after Lisa. . .

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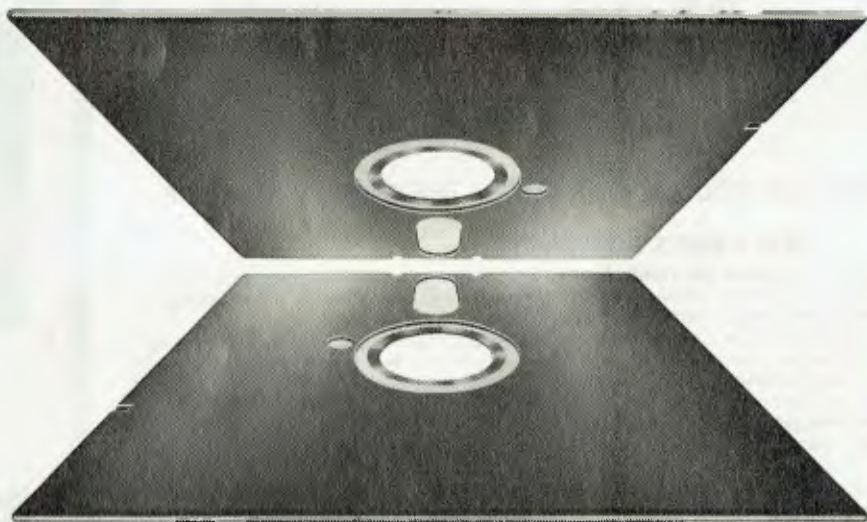
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The Roland Plot

It was just a matter of time before someone hatched a quality plotter with a reasonable price tag. Jeff Richards reviews Roland DG's DXY Single Pen X-Y Flatbed Plotter.

IT WASN'T TOO LONG ago that the average hobbyist considered himself lucky to have a decent monitor rather than a converted TV set, and even more recently a printer was definitely a luxury. Nowadays good quality monitors are less than \$200 and printers are not much more – simply as a result of the explosive growth in demand for these items, and the savings resulting from mass production. Could it be that plotters are about to go through the same process, so that quality units with extensive features are available at reasonable prices?

If the latest small plotter from Roland DG is any guide, then the answer must be "yes". Their recently released DXY-101 flatbed x-y plotter provides high speed, a large plotting surface, good resolution and an extensive range of in-built commands in a well priced package.

Roland DG is a Japanese manufacturer producing a variety of computer peripherals. Specifically designed to interface to personal computers, the range includes digital/analogue converters, music synthesisers and plotters. The plotter reviewed here is the smallest, cheapest and newest in the range.

A flatbed x-y plotter is one in which the paper is laid flat onto a plotting surface, and commands are issued to move a pen within the x-y co-ordinate system. Convention dictates that the x dimension is left-right and the y dimension is up-down. ►



On The Surface

The DXY-101 has a plotting surface of 370 mm by 260 mm within a bed of 460 mm by 300 mm. This means a useable plotting surface as wide as, but slightly shorter than, a standard 28 cm by 36 cm computer printout page. Step size is 0.1 mm, giving a range from the origin at bottom left to 3700,2600.

The whole unit is little larger than the plotting bed. This is largely due to the remarkably simple mechanism employed. The physical arrangement is much like other flatbed plotters — a pen mounted on a carriage on a vertical arm is moved up and down as the arm is moved back and forth. In the DXY-101 the arm is moved horizontally by a motor and cable mounted at the top of the unit. The pen carriage is moved up and down the arm by a motor mounted at the top of the arm, and the pen is raised and lowered by a solenoid in the pen carriage.

Usually, mounting the vertical drive motor and the pen solenoid on the arm would result in excessive weight in the arm, and the resulting inertia would lead to low acceleration rates and precision problems. Roland DG has attacked these difficulties by selecting a very light vertical drive motor and solenoid.

Unfortunately the acceleration rates are not quoted, but the distance accuracy figure of one per cent or less and the repetition accuracy of 0.3 mm or less are quite acceptable for a unit in this price range.

Going Around In Smooth Circles

In practice, it is only with the finest ball-point pen that the steps and any positioning errors are visible. With the usual felt-tipped pen diameter of about 0.4 mm, diagonal lines and circles appear smooth.

The DXY-101's drive motors are controlled by an electronic module mounted underneath the plotter bed. This uses a microprocessor and a control program in ROM. The main board handles the parallel interface, while a second board handles the serial interface. The whole control package is remarkably small — testament to the efficiency of microprocessor-based control units. Power is supplied by a remote plugpack, which at first seems a little strange, but in practice is effective. It is not a typical plug-pack, but a unit of decent size and rating, and the arrangement is practical.

Front panel controls are limited to pen up/down and home. These controls are probably adequate, as there should be no need to manually position the pen after power up. Indicators are provided for power and pen up. The power indicator flashes if the control logic detects an error in a command sequence, but

plotting continues unless an attempt is made to plot outside the legal limits. The logic is remarkably tolerant of plotting errors, usually just picking up where it left off if any invalid or out-of-range plot commands are sent.

Easy Interface

Interfacing the DXY-101 should be easy for most computers. A standard Centronics parallel port is provided, and it must be pretty standard as I simply plugged it in where my printer had been and it worked first time. The manual gives full details of the interface, including a timing diagram, and there is provision for ignoring bit 7 if necessary.

This provision reveals the effort that has gone into making the plotter compatible with most systems. Strictly speaking, the Centronics interface provides for eight data bits, but some systems use a single eight-bit output port and assign bit 7 as the strobe bit. By offering the option of ignoring bit 7 Roland has ensured that the plotter is compatible with these systems, although the extended character set will not be accessible.

(I did find one difficulty in interfacing a Kaypro. The DXY-101 requires that pin 18 of the Centronics connector is left open. The connector diagram and the circuit diagram for the Kaypro show this pin as unconnected, but in fact it is tied to +5V through a current limiting resistor (R21). Kaypro users will have to break this connection, either in the cable or at R21.)

In addition to the Centronics interface, a serial input connection is provided. This operates at RS232 levels and baud rates from 300 to 9600. The plotter provides 3 handshake signals — device on-line (pin 4), ready to receive (pin 5) and busy (pin 19). The last two would be used to control transmission, depending on the logic level required by the host. There is no provision for XON/XOF protocol.

Full details are supplied for connecting to the IBM-PC, APPLE II and TRS-80. Examples provided in the manual make it clear that these interfaces have really been checked out, so most users can be confident of being able to interface the plotter with little trouble.

Not only is the interface constructed to be suitable for most microcomputers, but the command sequences to control the plotter are equally universal. For instance, to move the pen to a position 200 mm along the X-axis and 500 mm up the Y-axis the required BASIC statement would be `LPRINT" M200,500"`. All the commands take a similar form. This makes fixed command sequences easy to code, but variable sequences become a little more complex. For instance, to

move the pen to position X,Y the command would be `LPRINT" M";X",";Y`. In addition, X and Y must be integers.

Despite these restrictions, the command sequence is logical and sensible for the BASIC programmer. However, those trying to construct an interface in machine language would find it annoying to have to convert the numeric values to ASCII codes, as the natural language of micros is 8 or 16-bit binary. It is a pity that an alternative command format is not provided.

Colourful Rectangles, Arcs, Dashes...

What sorts of commands are available? The pen can be moved either with or without drawing a line to any absolute position, or any position relative to its current position. The line to be drawn can be specified as either solid or dashed, and the dash spacing selected. A string of characters can be printed in one of 16 sizes and four orientations, and one of ten special markers can be drawn at the current position. Circles or parts of circles, and radii and parts of radii of circles can be drawn. Rectangles can be drawn either blank, or with one of four varieties of crosshatching.

Axes can be drawn with a specifiable number and spacing of scale markers. In addition, the plotter has a special printer mode, in which it behaves like a line printer, printing all characters received until the page is full, and then waiting while the paper is changed before printing the next page. This printing is painfully slow, but the quality is excellent.

The pen move commands can have the position parameters strung together in pairs without the requirement of continually issuing the command code — the code stays in force until an end-of-line marker is detected. This end-of-line marker is a carriage return or line feed. This means that shape tables can be built up as strings and printed at any position using the relative plot commands. Shapes that require the pen to be raised and repositioned are not quite as simple.

For graph work the inbuilt commands are useful. Axes can be drawn and marked with a single command, and labels and scales printed alongside. Line graphs can use the special marker characters to identify nodes, and each column of a bar graph, complete with crosshatching, requires only one command. The position of radii to be drawn is specified using a percentage figure, with 100 per cent at the top of the circle, so is ideally suited to pie charts. Pie charts with a dislocated segment would be a little harder. ►

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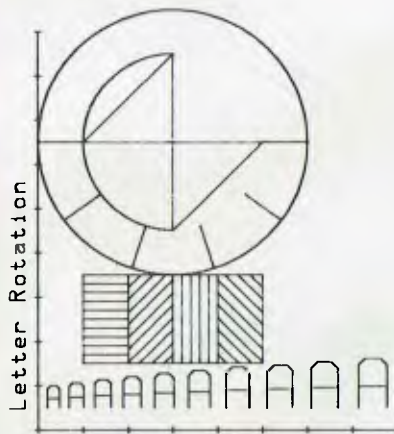
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```

10 LPRINT"A600,1000"
20 LPRINT"M600,1000"
30 LPRINT"D400,1000,600,1200,600,":
40 LPRINT"800,800,1000,600,1000"
50 LPRINT"C600,1000,300,0,360"
60 LPRINT"G200,90,270"
70 FOR I=25 TO 75 STEP 10
80 LPRINT"K";I;".200,300"
90 NEXT I
100 FOR I=1 TO 4
110 LPRINT"M";I*100+300;".500"
120 LPRINT"T3,100,200,20,":I
130 NEXT I
140 LPRINT"M320,400"
150 FOR I=6 TO 15
160 LPRINT"S";I:CHR$(13):"PA"
170 NEXT I
180 LPRINT"M300,350"
190 LPRINT"X1,100,8"
200 LPRINT"M300,350"
210 LPRINT"X0,100,9"
220 LPRINT"S4";CHR$(13):"Q1"
230 LPRINT"M270,400"
240 LPRINT"PLetter Rotation
250 LPRINT CHR$(27):"1"
260 LLIST

```



A demonstration of the use of in-built commands to create a diagram.

Pen Problems

In use, a few small problems came to light. The pen holder is not as convenient as it could be. Pens are installed by slipping them into a pen holder and tightening a collar. The holder then slips into the pen carriage. Tightening the collar sufficiently to prevent the pen gradually working up is not easy, and if you expect to change pens frequently, for instance to change colours, I would suggest buying several pen holders. But then, the caps cannot be put on the pens when they are in their holders.

The paper is held down by flexible magnetic strips. Two are supplied, but more would be handy, especially if you are working with large sheets - small flexible strips in various shapes are available at novelty stores. There is no provision for switching the plotter off-line, as there is with most printers. This is a nuisance if the pen suddenly dries up or the paper moves in the middle of a plot.

These small points aside, the plotter is extremely easy to use. A stand per-

mits the unit to be tilted up to about 60 degrees, so it uses only a little more desk room than a printer. The remote power pack also helps to reduce the footprint.

Best Peripheral Manual

The manual supplied with the DXY-101 is one of the best I have seen for a peripheral device of this type. It is short, since the plotter is not complex, but it is well organised and the information is clearly presented. Each command has a brief description and a small sample program. When the samples are strung together they create a test pattern which is supposed to match an example supplied in the manual - a neat way to get owners to create their own test procedure.

There are a few areas in which information is lacking; for instance, there is only the briefest mention of the extended character set and only a very roundabout hint on how to access it. I also found one small error in a command description.

Overall, the manual is a good example of how this type of document should be produced; it is written by someone with a good command of English, it has plenty of detail on the interface, examples of all the commands, and hints for owners of particular types of micros.

The manual is, in fact, an example of the strategy behind the product. It demonstrates how Roland DG set out to produce a simple, practical, rugged device that can be used with almost any computer and will permit the new owner to get useable plots almost immediately, while providing plenty of potential for additional applications.

While plotters are not quite down to a price where they are a part of every hobbyist's required equipment, things are obviously changing quickly. At \$895 the Roland DG DXY-101 deserves to be at the fore of this development.

UNIT: Roland DG DXY-101 Single Pen Flatbed Plotter.

RANGE: 370 mm by 260 mm.

SPEED: 180 mm/s maximum.

STEP: 0.1 mm.

INTERFACE: (1) Centronics standard parallel, 7 or 8 bit. (2) RS-232, 300 to 9600 baud, hardware handshake.

REVIEW UNIT SUPPLIED BY: Roland Corporation Australia, 39 Victoria Street, Fitzroy 3065.

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AST produce a range of IBM PC addon memory products which recently placed No. 1 in PC WORLD magazine user poll. These multifunction cards have memory from 64-512k as well as clock/calendar, Superdrive and Superspool software and extra serial, parallel and games output ports. AST also market full range of communication products such as IBM SNA, 3780, BSC and System 34, 36, 38 emulation cards as well as PC Net local area network systems.

★ LOTUS 1-2-3

Rated No. 1 on "Softalk's" monthly rating of the best IBM PC software. With 1-2-3, you can be using your IBM PC in a surprisingly short time. Even if you've never been near one before. 1-2-3 instructs you right on the computer's screen in a friendly, helpful way, so you learn as you go along. Everything is in English, not code, so there's no new language to learn. There's even a special HELP key you can press to put special instructions on the screen if you can't remember what to do next. But for all its comforting ease of use, 1-2-3 is one of the most powerful programs available for the personal computer. It combines spreadsheet, information management and graphics all in one.

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★TIM III	Database manager
FAST FACTS	Personal filing and reporting package
PROKEY	Keyboard programming utility
SIDEWAYS	Vertical print utility
APL PLUS*PC	APL programming language for the IBM PC
★CROSSTALK	Communications and terminal emulation program

HARDWARE

IRMA BOARD	IBM 3278, 3279 terminal emulation card
PCI 1051	IBM SYS 34, 36, 38 - PC interface
PCI 1076	IBM SNA/SDLC - PC interface
SWEET-P	12 Colour graphics plotter

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Experience With Imports

PERHAPS MY experience with the Customs Department may help some readers. A friend from the Isle of Man (UK) stayed with me for her summer holidays. At that time I had a Sinclair ZX81, with all its problems.

When my friend went home she sent me an 'unsolicited gift' of a ZX Spectrum. The Customs Department charged me \$93 duty (for which I got no receipt), even though it was obvious the parcel came from a private person.

After two letters to the C.D. and one to the Minister in Canberra, I discovered I would have to visit the C.D. at Redfern Mail Exchange to get satisfaction. There, I discovered that regardless of what was on the parcel, the C.D. assumed it came from a mail order firm and that I had ordered it. They also assumed a value of 175 pounds, which included VAT of 15%. VAT should have been deducted. I had to fill in a Statutory Declaration and will get the money back eventually.

To those who are asked to pay duty I would urge them to write to the Customs Department until they tell you exactly what figures they used to calculate what you paid. In my case I didn't discover this until I received the letter from the Minister.

L SHANNON
Hurstville, NSW

Disappointed With NEC

I READ your article on the Personal Computer of the Year in the May issue of *Your Computer*. After reading it and researching the NEC APC, I went out and purchased one. With my APC (the dual disk, monochrome model) I also bought a PC-8023B-N printer and a 120 cps bi-directional printer. I purchased CP/M-86 and CBASIC-86 with my machine.

and CBASIC. I then resolved to learn how to use the 'nothing short of superb' graphics I read about in your article. After poring through the manuals and finding nothing, I rang NECISA and asked about the APC's graphics.

It was through this phone call that I found the graphics that won the NEC the title 'Personal Computer of the Year' cost from \$981 upwards for a hardware board. I was also told 'You're not the first to get caught with that', meaning that others have been caught with the same misleading advertising.

NEC says in all its ads (not only in YC) that "The APC's high-resolution colour graphics run circles, arcs and lines around everybody else". Later in the advertisement they claim to be offering you: "All this for under \$5000, recommended retail price, including tax".

However, to get the system advertised here it would cost \$4914 for the APC-HO2 and \$981 for the graphics subsystem - making a total of \$5895.

This is considerably more than the \$5000 mentioned in NEC's advertising. I, for one,

am a very disappointed customer.

KEN WOOD
Seven Hills, NSW

Absolute Beginners?

IT WAS A pleasant surprise to see my 'Absolute Beginners' Guide To S-BASIC' reviewed in your August edition.

Jeff Richards' main criticism seems to be that "it attempts to deal with the beginner BASIC programmer as well as the newcomer to S-BASIC. I would have preferred it to have assumed that the reader had already digested one of the Introduction to BASIC-type books."

Surely the inclusion of 'Absolute Beginners' in the title should have protected the admittedly slim volume from that particular criticism.

DAVID HILL
East Bentleigh, VIC

CP/M And The Apple IIE

RECENTLY I was shopping around for a microcomputer and decided I should buy a machine with a CP/M operating system, but because I wanted to have the option of running educational software I purchased an Apple IIE.

I was then faced with the prospect of finding another \$500 to purchase the recommended Microsoft Softcard Z-80 card in order to run CP/M. By this stage I felt like I had just completed a financial city-to-surf, and my bank manager did not respond in the way I had hoped when I threatened to take my overdraft elsewhere.

So, I opted to purchase an unbranded 'Apple II' Z-80 card (not a genuine Apple product), that sells for around \$170, in the belief that Apple II hardware was compatible with the IIE. My card did not appear to work, and my supplier generously let me try two other similar cards in my machine with the same result. Even more generously, he then refunded my money and I purchased a different el-cheapo card from a different supplier.

Once again, this did not work in my machine, so I returned it and I was offered a Magmedia Z-80 card (also valued at \$170) as a replacement. It worked. At last I was running CP/M. I am now pleased with the performance of my IIE, and I would like to share some things I learnt in the course of the above adventures.

While the Microsoft Softcard works in nearly all IIE machines, only about 20 per cent of the cheaper 'Apple II' Z-80 cards will work in a given IIE machine. This figure is based on the experience of a number of dealers, although this fact has not, to my knowledge, been previously published in a local or overseas computer magazine. If you are buying

one of the cheaper Z-80 cards it is necessary to try different cards in your own IIE until you find one that works.

You can test whether a Z-80 card is compatible with your IIE by booting CP/M, entering MBASIC, and running the program below. If the hardware, including the Z-80 card, is operating correctly, then line by line the entire screen gradually fills with characters, with the position of each character in a line being slightly offset from its position in the previous line. When the screen is full, it scrolls upwards and after several screens the test can be terminated with a control-C. If the card is not compatible, several lines of characters appear and then there is a break in the program and nothing further appears.

I hope this letter will assist other Apple IIE buyers. I might add that I have found that popular CP/M programs in Apple II format run perfectly well on the IIE.

```
10 REM "APPLE 2 CPM TEST PROGRAM"
20 FOR N=32 TO 112
30 PRINT CHR$(N);
40 NEXT N
50 GOTO 20
```

GREG GOLDSTEIN
Sydney, NSW.

Space Game For PB100

BECAUSE so many people have bought the Casio PB-100 personal computer, could you publish a space game program in BASIC PB-100 language?

I think there are only a few programs for this machine - the ones in the manual - and only two of them are games; the rest are business programs.

L JONES
Bowral, NSW

Computer Therapy - Can You Help?

I AM A psychologist working in the field of clinical neuropsychology and conducting research into rehabilitation after head injury and other forms of brain damage. I am evaluating the use of microcomputers in cognitive rehabilitation and would be interested in receiving literature, software details and descriptions of equipment from any individual or organisation which has material that might be of use in rehabilitation of brain functions using microcomputer games and tests. Such tests/games might involve reaction time, spatial planning, memory and so on.

Apple and Commodore equipment are the hardware currently in use. Consideration would be given to testing equipment in clinical research with brain-injured people for possible inclusion in their home rehabilitation programs.

I can be contacted at the Department of Primary Care and Community Medicine, Flinders Medical Centre, Bedford Park, SA by mail.

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Can't Seem To Fine-Scroll

AFTER TRYING for over two months to fine-scroll user-defined graphics (that is, one pixel at a time) on my VIC-20, I have decided to write to you for help.

The scrolling I'm after is the sort seen in arcade games and cartridges like Gorf, Chop-lifter and so on. If any of your readers could help me, I would ask them to contact me at the following address:

JASON PEARSE
90 Bathurst Road
Orange 2800

Boo, Hiss, Applied Tec

I BELIEVE your readers should know that the service I have received from Applied Technology is of such a low standard that it makes the Microbee virtually useless, with delays (up to months) being common.

I bought this computer chiefly because advertising stated there would be user back-up. Instead, all my queries have been ignored, though subsequently all faults have appeared in your magazine — the latest being that after having lots of troubles with keyswitches, I decided to replace all of them, stating this in my order sent Priority Paid 5/7/83 (because ordinary letters 'go astray') and charged for 15/7/83. As of this date (14/9) I have received NO REPLY and NO GOODS.

Your latest magazine shows keyswitches apparently have not been reliable, and a modification is available. Why didn't Applied Technology inform me of this modification instead of charging me \$106.80 for new keys (still not received)? My phone bill has risen enormously from trying to confirm whether orders or queries have been received, as their 'policy' appears to be 'no correspondence entered into'.

So much for 'bitching'! I would like to congratulate you on the excellence of your publication; it has helped me tremendously in understanding computers.

FRANK HILL
Leinster, WA

Hitachi User Group

I WOULD appreciate any help you can give to publicise the formation of a user group in South Australia for the Hitachi range of computer systems. We welcome members from any state, but will cater primarily for those in SA and NT.

The contact address is:

Cliff Hignett
45a Ormond Ave,
Daw Park 5041.
(08) 274 9341 (bh)

(After hours, contact Geof Drury on (08) 295 2778.)

The form the group will take is as yet undecided. Initially, those who are interested will have their names circulated, so that personal contacts can be made.

CLIFF HIGNETT
Daw Park, SA

Software For ZX

A NEW software company for the Sinclair ZX81 has been formed and is called Padular Programs. It has an extensive range of 1K and 16K programs, as well as a variety of listings and inexpensive blank cassettes. No cassette costs over \$8.00 and most listings are less than \$1.00 each. Titles available include: Byte-Man, Donkey King, Avenger, Star Fighter and 1K Games Packs. A fully illustrated catalogue may be obtained by writing to Padular, 22 Brand Street, Bundaberg 4670.

PATRICK CARSWELL
Bundaberg, QLD

Software Copyright

SOMEBODY MUST HAVE lobbied pretty hard to get an announcement, only three days before Christmas, from three Ministers threatening speedy and even retrospective legislation on copyright.

If it's really to protect an 'Australian software industry', the legislation will not be automatically extended to cover foreign software. This would require a separate proclamation under the Copyright Act, anyway, and there is ample precedent for not extending it. The United States, for example, refused to recognise foreign copyright on books for many years, in the interests of its own book manufacturers (as distinct from authors).

If legislation covering foreign software is introduced hastily, it will not be to protect an Australian industry, but will be prompted by fear of what would happen if people get used to freely available software, even for a few months. That's why 'Software Liberation' is encouraging the rapid dissemination of as much uncopyrighted imported software as possible, before any legislation can be introduced.

Obviously, programming has to be paid for, but royalties aren't the only way to pay for it, any more than commercial ads are the only way to pay for TV. Ultimately, software could be treated like scientific research — with publicly funded grants and contracts, and the results placed in the public domain. Australia could lead the way in this, by refusing to recognise foreign copyright (especially US software copyright, which requires registration in the US) and instead, undertaking to fund an amount of public domain software equal in value to what Australians would otherwise have paid overseas for royalties.

That is more or less what we do instead of just living off other countries' basic scientific research, and it makes a lot more sense than trying to recover the costs of research by high prices on scientific journals and lots of police guarding photocopy machines. We would actually have an Australian software industry then, instead of representatives of foreign monopolies trying to con our Government that 'What's good for Apple is good for Australia'.

Meanwhile, Australia could enjoy the benefits of free software for most computer users here, at the cost of a very small compensation payment to the practically non-existent Australian packaged software industry. (Contract programming is unaffected by the present copyright situation).

Computer users should *urgently* demand a public inquiry before any special legislation.

ALBERT LANGER
'Software Liberation'
c/- Unemployed Workers Union
301 St Georges Rd
North Fitzroy 3068

Foreign monopolies? What's good for Apple is good for Australia? As far as we're concerned, Apple is incidental to the whole question. How many people consider Apple, or any other of the big guns like IBM, a software company? What is really important to us (at YC), as users of computers, is the availability of good software. If it's good, it's worth paying for - if it's not, we don't buy it. We certainly don't want to live without it, and that's what will happen if it stays unprotected.

For example, we use US-written operating systems - in particular, G & G Engineering's MP/M 8-16. It's a brilliant piece of work, and the company is one of the most responsive we've seen: there are regular new versions released which contain features and improvements requested by users. Without protection, they would be stupid to send such software to Australia. And, even if we could buy a bootleg copy, we would have to wait months/years for the updates. When things went wrong, where would we look for support?

No thanks! We'll support software protection even if it does mean we'll have to pay for it. Anyone who has written even a mildly complicated program knows just how hard it is. People who are prepared to put the time and effort into writing good software - which is, regardless of any definition of "machine instructions", a creative work - deserve a reward. If they don't get it, they won't write; if they are too greedy, the market will bring them down to earth.

The suggestion of stalling any action while we consider the philosophical implications of an Australian attempt to change the way the world works (and, meanwhile, distribute as much 'free' software as we can get away with) is laughable. If the alternatives suggested above had been in operation in past years, we'd probably be able to look forward to 1990 as the 'breakthrough' year in which the publicly funded research organisations release VisiCalc ...

- Matt Whelan

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Great Microcomputers Of The Past - The Compucolor II

John Newman gives a personal account of how he came to buy a Compucolor II in the first place and then continued to expand its usefulness.

IT IS NOW over three years since I decided to give up all thoughts of a new car and sink the funds available into the purchase of a personal microcomputer. (With two young boys who are keen on Space Invaders, it has never quite become 'personal').

Looking back on that original purchase, I realise I should have carefully considered all the reasons for wanting a computer at home; particularly as I already had free access to several microcomputers at work. It was probably my ambition to always have the latest technological gimmick. My main concern was to buy the best piece of hardware at the lowest price. At the time, good software packages were scarce, apart from many games.

Hardware Considerations

Having used visual display terminals on disk-based time-sharing systems for many years, my sights were aimed a little higher than the average purchaser of home computers. Thus, I insisted on a machine having a disk for file storage rather than an audio cassette. I also wanted a screen with a sharp display of characters similar to a visual display unit (not an old TV set!).

In addition, I felt that graphics and colour display capabilities were important. (I was right on this point, since all current-generation micros have these features.) Finally, I thought it would be very nice to be able to use the microcomputer as a remote terminal for the large computer at work.

Hardware Choices

The three most popular personal computers at the time (1979) were the Apple II, Commodore PET and Tandy. I ruled out the latter two as they had no graphics or colour and no remote-terminal interface. The Apple looked promis-

ing, but there were a number of limitations. The screen had only forty columns and no lower case letters. Text and graphics could not be used simultaneously. Finally, when connected to a colour TV set, the display became too blurred to be tolerated.

The only other microcomputer that came close to meeting my specifications was the lesser known and more expensive Compucolor II. It had a built-in disk drive and an eight-colour graphics display of 64 columns by 32 rows. A terminal interface and communications control program were also included as standard.

Apart from the disk operating system and a Microsoft BASIC interpreter, there were some programs for finance, statistics, a database system and dozens of games. I decided to dig a little deeper in my pocket and buy a Compucolor II. It cost me \$2500.

A Little History

The Compucolor II, which was manufactured between 1978 and 1981, had



a rather unusual start. Intelligent Systems Corp (ISC) began selling colour graphic microcomputers as far back as 1973. The Intecolor 8000 was sold by the thousand as a relatively low-cost graphic display monitor for process control work. By 1977 Charles Muench, the founder of ISC, noticed the growing interest in hobby computers and decided to produce a cut-down version of his graphics computer, which he called the Compucolor II.

The Compucolor II was born about five years ahead of its time. While everyone else in 1978 was making do with black and white TV sets and audio cassettes, the Compucolor II had a built-in RGB colour monitor, disk drive, parallel and serial interfaces and a keyboard which could be expanded to a massive 117 keys.

In an attempt to capture a slice of the hobby market, the Compucolor II was promoted as a games machine at the same price as the Apple II. This was the beginning of the end for the Compucolor. The price was set so low that dealers were left with almost no margin. The original software consisted largely of games and simple educational programs. ISC never thought that owners would want to write their own software.

So, lack of margin for dealers and lack of encouragement of user software development meant only about 5000 Compucolors were ever built, 500 of which ended up in Australia.

ISC eventually replaced the Compucolor with the Intecolor 3651, which is software compatible but has a restyled cabinet and larger disk capacity. Its price has taken it out of the home computer class.

Those users who stuck with their Compucolors however, were later helped by two important factors. First, the Compucolor, being a cut-down version of a fairly sophisticated graphics computer, has a wealth of hidden features — such as a built-in real-time clock and interval timers, four different character sizes in eight colours, and a very good disk operating system with BASIC, and communications and graphics software all in ROM.

The second factor is that a very high percentage of Compucolor owners are computer professionals. This soon led to the creation of a wide range of good software, including word processors, database systems, spreadsheets, business graphics and at least 300 colour graphic games. The screen editor for BASIC is still one of the best I have ever seen for a microcomputer.

How Was It Used?

As soon as the machine was set up



The Compucolor II — ahead of its time.

at home, my two sons became the major users, actually giving up television in order to try out all the games. Hoards of their mates also appeared each afternoon after school.

My first task was to work through the set of ten disk-based tutorials on: how to use the Compucolor operating system, programming in BASIC, and using colour graphics. Having completed this, I put my new toy to 'work' by writing many programs to generate spectacular colour graphic displays. It was this type of program that started my elder son's interest in programming. He attended the first computer course for primary students held in Western Australia, and has been writing programs ever since.

Apart from writing a few larger programs for controlling digitisers and graph plotters, my own computing interests turned to the increasing range of software packages. Those I use regularly are a database system, word processor and business graphics programs.

As well as the software, I dabble in hardware additions such as multiple banks of memory and more graphics character sets. The machine has gradually been expanded to incorporate the full 64K memory, two disk drives, ROM-PACK, a printer, sound and a joystick.

Problems

As with any microcomputer there are

some deficiencies which become more and more obvious when you look at the features on the latest models. The main weakness is the capacity of the disk — a mere 52 Kbytes on each side. Another problem is the relatively crude disk controller/interface. In an effort to reduce costs, ISC fitted a super-simple disk interface which results in occasional difficulties in reading disks written on another Compucolor.

The graphics resolution limits the machine to business graphics and games. Three graphics modes are available. Low resolution is 64 by 32, with 32 colours. Vector mode (line drawing) is limited to 128 by 128. Graphic character mode is a little higher at 384 by 256. Both of these modes have eight colours.

The Future

I keep expecting, with every release of a new microcomputer, that I'll be able to rush out and buy a replacement machine for half the original price. I'm still waiting. Most of the new micros with an RGB colour monitor, disk drive, software and so on, cost over \$4000. However, the one machine I have my eye on is the new CP/M-based colour Microbee. The hardware price looks good, although there will be some catching up to do in the area of graphics software.

Meanwhile, with ninety disks full of software, I'll stick to my Compucolor. □



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SERIES 2 ADVANCED PERSONAL COMPUTER

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KEYBOARD: 60 key FULL SIZED QWERTY layout with full travel.

MEMORY: 64K comprising of 8K ROM, 4k graphics and screen memory.

DISPLAY: Direct video to external monitor or modified TV. 80 by 24 and 64 by 16 character display modes, high resolution PCG graphics to 512 by 256 pixels. Upper and lower case with full programmability at any screen location.

SOFTWARE: CP/M 2.2, MICROSOFT BASIC-80, WORDSTAR 3.0, MULTIPLAN V1.05, MICROWORLD BASIC V6.0, WORDBEE, EDASM, CP/M UTILITIES, COMMUNICATIONS PACKAGE, MICROWORLD SUPPORT LIBRARY.

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Getting dBase From dBase

Part VI

Continuing his series of articles on the world's most popular database management system, Les Bell turns his attention to programming ...

WITH ALL the commands we have covered so far, you should now have a pretty good idea of setting up databases and using them manually from the keyboard. It's time to start programming.

dBase programs simply consist of the same commands we've been using, one after another in text files. In the 8-bit version of dBase, these files have the extension of .CMD, and are known as command files. In 16-bit versions, they have a .PRG extension.

dBase has a simple text editor built in, which can be used to write programs — or any kind of text. The command

MODIFY COMMAND <filename>

will create a file (filename.CMD), if it does not already exist, and will clear the screen ready for entry. If the file does exist, the first screenful will be displayed.

The editor works in a similar way to WordStar or the other full-screen editing operations of dBase, except that moving up or down a line returns the cursor to the beginning of the line. Don't forget that ↑ W exits from the editor, not ↑ KQ!

A command file simply contains ASCII text, and, so it can be edited using WordStar in non-document mode, it contains VEDIT, WordMaster, PMATE or other editors, depending on your preference. In fact, the dBase editor has some nasty habits, like truncating any text beyond eighty characters. So, other editors are preferable for major editing jobs like file creation.

dBase command files consist, for the most part, of the commands we've covered already, with the addition of a few new ones which control the program flow and additional forms handling.

To execute a dBase program, once it has been created, use the command

DO <filename>

This immediately loads and starts execution of the named file. The same command, within a running program, loads and runs a subroutine. This is the primary way of structuring large (more than, say, 100 lines) dBase programs. So, large systems tend to take on a kind of tree structure.

your computer



Generally, each node in this network is a menu, within which the program loops, offering the user a number of choices, each of which corresponds to one of the subsidiary .CMD files.

A simple command file can be used, for example, to set up the dBase parameters the way you want them before starting work. A sample program to do this, called SETS.CMD, is supplied with dBase version 2.4. You can make up your own — for example, on a Kaypro, you will generally want to disable the half-intensity mode, log in to drive B: and perhaps set CONFIRM on. A sample .CMD file to do this, called START.CMD, would look like:

```
SET INTENSITY OFF
SET DEFAULT TO B:
SET CONFIRM ON
```

To get the command file to execute, use the command

DO START

or, to eliminate the wait while dBase loads, simply type (at the CP/M command line):

A>DBASE START

This will load and run dBase, which will then execute the START.CMD file. Be aware however, that this will bypass the dBase date entry routine, so the system will think the date is 00/00/00. To get around this, you will need to provide your own date entry routine — see Monty Jaboor's routine published in YC (January 1983).

Before we start writing any programs, we need to have one more aspect of dBase programming under our belts: memory variables. After all, what kind of programming language would it be without any variables?

dBase allows the programmer to use

up to 64 memory variables: they are called memory variables to distinguish them from the database fields, which the language also allows the programmer to regard as variables. Like fields, there are three types of memory variables: character, numeric and logical. A memory variable acquires its type at creation, generally as an implicit result of the statement in which it appears. There are no explicit declaration statements in dBase; a memory variable is created the first time it is used.

Probably the most distracting feature of the language is its lack of equals (=) signs in assignment statements. To store a value into a memory variable, you use the STORE statement:

STORE .46 TO mcorptax

STORE 'Anonymous' TO mname

STORE t TO mgo

This can be confusing, especially if, like me, you are perpetually switching languages. However, it soon becomes quite natural. If it continues to give you problems, you will be pleased with the forthcoming dBase 2.6, now in alpha test. In the meantime, learn to live with it ...

There are a couple of conventions illustrated in the examples above. First, in dBase command files, commands and keywords are always typed in *upper* case, while variable and field names are in lower case. This is because dBase does not prevent you using its own keywords as variable names — something that can make programs confusing without case differentiation to help. Second, it is common practice, though not mandatory, to prefix memory variable names with an 'm', to distinguish them from database fields. Bear in mind also that dBase variable names can be up to ten characters in length.

In the examples above, mcorptax will be created (if required) with a type of numeric, mname will be of type character and length 9, and mgo will be of type logical. There is a dBase function, TYPE(expression), which will return C, N or L to indicate the type of a memory variable. So,

? TYPE(mname)

for example, will return 'C'. Incidentally, the TYPE expression will return a 'U', for undefined, on certain expressions.

Numeric variables are stored as 10-digit BCD (binary coded decimal) numbers. The use of BCD means that

rounding errors on decimal fractional amounts are avoided, making dBase particularly suitable for commercial programming.

Character variables are stored as a length byte, followed by the characters themselves. Thus the word 'cat' would be stored as

```
03c a t
```

There are limits on string operations. Since the length is represented by a single-byte value, it follows that the maximum length a string can be is 255. In practice, it pays to avoid long strings and try to stay under the 250 mark.

Early versions of dBase did not issue warnings when strings overflowed. Instead, puzzling failures occurred. For example, concatenating two 129-character strings produced a string of length two bytes, plus a corrupted area of memory ($129 * 2 = 258 = 256 + 2$). Furthermore, some versions of dBase take a violent dislike to strings of length 64, for some reason, so avoid that magic number if possible.

To display the variables currently in memory, you can use the command

DISPLAY MEMORY

This will display the names of all current memory variables, together with their type and contents. It also shows the number of variables used and the number of bytes of the variables used.

To display a particular variable's content, use the '?' command. This operates like BASIC's PRINT statement; you just follow the '?' with a list of things you want printed, be they constants, variables or expressions. Commas do not cause zoned printing. They simply concatenate items in the print list.

The '?' command outputs a carriage return or line feed before the print list; in other words it takes a new line. The '??' command does not, but is otherwise the same.

There are a couple of ways of getting keyboard input into memory variables. The ACCEPT command can be used to print a prompt and wait for input in the same way as the BASIC INPUT statement. A basic example is

```
ACCEPT TO mname
```

which simply displays a colon on the screen and waits for the user to type a string in response. Notice I said a string, and I meant that deliberately: no matter what you type, dBase stores it as a string variable. It matters not a whit that what you typed is an integer; dBase will store it in a character variable. Even if the variable you ACCEPT to is of numeric type, after the ACCEPT it will be a bird of a different feather.

To produce a more useful prompt, try

```
ACCEPT "What's your name" TO mname
```

Again, the prompt is a colon, but this time at least it asks a question. Fear not.

There are much more elegant ways of getting input to dBase.

The INPUT statement does much the same thing, except it tries to determine the type of the input. For character strings you have to use quote delimiters around the string, but for numeric and logical data, it's ok. Again, prompts are permissible. So, you get the following:

```
INPUT "What's your name" TO mname
```

```
What's your name: Tom
SYNTAX ERROR, RE-ENTER
:Tom'
```

In general, therefore, ACCEPT should be used to input strings and INPUT for numeric and logical data.

Because there are only 64 memory variables, each one is precious and has to be used to maximum effect. dBase does assist in this by allowing us to free space using the RELEASE command:

```
RELEASE ALL
```

```
RELEASE mfred, mjack
```

```
RELEASE ALL LIKE menu* - V 2.4 only
```

```
RELEASE ALL EXCEPT mast* - V 2.4 only
```

The first version of the command frees up the space used by all memory variables, while the second releases only mfred and mjack. The last two versions make use of a wildcard expansion technique similar to CP/M's. The third version would release menua, menub, menuc, menuchoice and anything else that began with menu, while the fourth

will release all variables except those that begin with mast - mastselect, mastkey or whatever.

If we want to preserve memory variables for future use, but regain some space in the meantime, we can save them to a memory file on disk and then release them. In version 2.3 we can only save the complete contents of memory, using the command

```
SAVE TO <filename>
```

In version 2.4 we can also save selected variables, using the command

```
SAVE TO <filename> ALL LIKE <skeleton>
```

For example:

```
SAVE TO mainmenu ALL LIKE menu*
```

To get the variables back into memory, we use the RESTORE command. In version 2.3, we can only load memory in one lump, overlaying and destroying the previous contents. In version 2.4, we can specify RESTORE ADDITIVE, which will restore the memory file contents in addition to the existing contents of memory. The two versions take these formats:

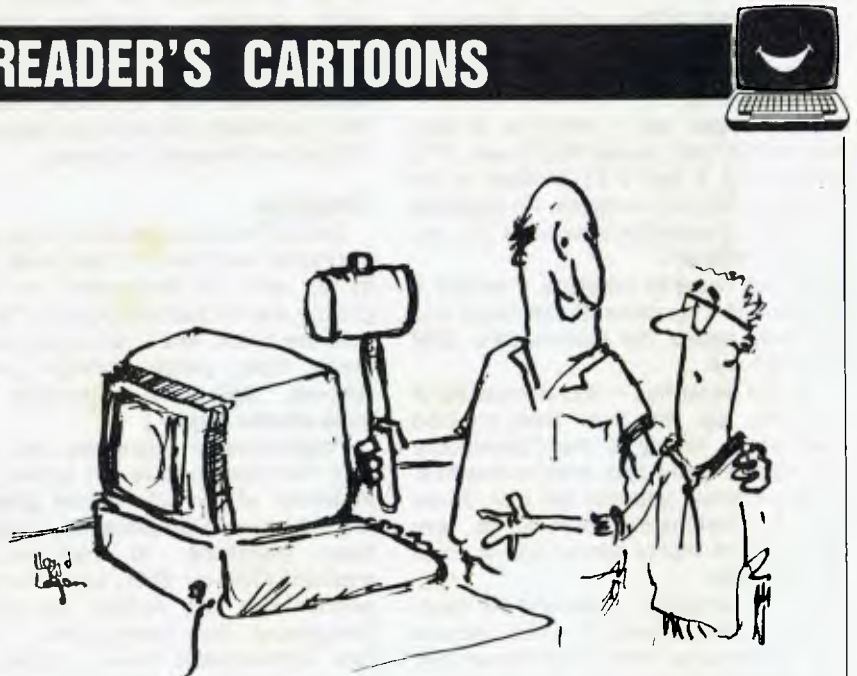
```
RESTORE FROM <filename>
```

```
RESTORE FROM <filename> ADDITIVE
```

These commands provide a way of saving space, as well as saving the context of a program at a particular point in its execution. This can occasionally be useful for debugging purposes.

Next month, we'll start using memory variables for programming. □

READER'S CARTOONS



And this is the "manual" reset key . . .

your computer



OWNER REPORT

The Commodore 64 hasn't been around for long, but it has plenty of dedicated users. Numbering himself among them, Michael Jennings reports on his C64.

THE COMMODORE 64 was released in Australia in March, 1983, having followed the VIC-20 in its move into 'Gee Whiz' machines with lots of colour and sound. I have had my Commodore 64 for about two months and intend to use it for general 'hacking' around and playing games.

The Commodore is a 'keyboard only' computer (everything is in the keyboard module). It has a full typewriter keyboard (62 keys), with no numeric pad and four function keys on the right. The case is cream with chocolate-brown keys.

At the back of the unit are numerous expansion connectors and interfaces. These are (from left to right, looking from the front):

a) The user port - which is, in fact, an RS232C port, except that it uses TTL voltages (5 V and 0 V), instead of the standard RS232C voltages. An interface cartridge is available to convert the voltages to RS232C.

b) The cassette interface - suffice it to say that it operates at 300 baud and will only accept the Commodore C2N cassette unit.

c) The serial bus - this is capable of handling up to five daisy-chained peripherals. Nearly all the Commodore peripherals for the C64 work on this bus. At the moment you can get disk drives (which unfortunately seem to be very slow), a dot matrix printer and a small printer/plotter.

d) The composite video and RF (television) outputs, both of which include the sound signal (the sound signal from the composite video can be fed into a hi-fi system). The picture (on my colour TV) is rock-steady and, although the colour is a bit blurred, is excellent for an RF modulator.

e) The expansion port is probably the

The Commodore 64 -

most useful of all. It is a 44-pin female socket which can take a ROM cartridge of (like the Apple's expansion slots) just about any type of interface or peripheral. Articles available at present are a range of games on cartridge, a Centronics printer interface, a Z-80 cartridge (to run CP/M), and an IEEE-488 interface (to allow the use of peripherals from larger Commodore computers). A -board is also on the way, which will allow the use of more than one device at a time.

f) On the far right of the computer are two joystick ports, each of which can be connected to a joystick (logical), a pair of paddles or a light pen. On the right you also find the on/off switch and the connectors for the power supply.

Inside The C64

A peek (no pun intended) inside the unit, which seems to be heavily RF-shielded, shows a single board with a 6510 CPU (6502 compatible), a 6581 sound chip and a VIC-II display chip, among many smaller chips (TTL and so on). The RAM and ROM are out of sight.

The 6581 sound interface device (SID) provides the best sound effects and music I have heard on any computer. It has three voices, each independently controllable for volume, pitch (eight octaves), waveform (triangle, sawtooth, rectangular or white noise), and an ADSR (attack, decay, sustain, release) ratio. With all these functions the Commodore 64 would put some dedicated synthesisers to shame.

Graphics

The VIC-II chip provides a large range of graphic functions. Its text mode is 40 by 25 with 16 foreground, 16 background and 16 border colours. (The colours are black, white, red, cyan, purple, green, blue, yellow, orange, brown, light-red, light-green, light-blue and three shades of grey.)

Programmable characters are available, but most people will ignore them in favour of the bit-mapped graphics. The bit-mapped graphics do, however, have limitations. In high-resolution graphics (320 by 200), each character position can only contain two colours (foreground and background). Therefore, sophisticated colour graphics are not possible. Personally, I prefer to use the 160 by 200 mode, which allows four different colours in each character position.

Probably the best feature of the graphics is the sprites. Sprites are mov-

able high-resolution objects. Each is 24 by 21 pixels and can be any of the sixteen colours. A sprite can be enlarged, have its colour changed, or be moved in relation to something else on the screen. Sprites provide the smoothest animation I have ever seen. They can be used in any display mode (text, hires and so on). Lower-numbered sprites have priority over higher-numbered sprites (sprite 1 moves underneath sprite 0), and you can use up to eight sprites at a time.

Software

The Commodore 64's software in ROM consists of two components: an 8K BASIC interpreter and an 8K kernel.

On power-up the Commodore 64 gives the message: **** COMMODORE 64 BASIC V2 ****

64K RAM SYSTEM 38911 BYTES FREE

READY

Although the Commodore 64 has a full 64K of RAM, only (I seem to be getting memory-greedy) 38K is available for use from BASIC. This is because of the 6510's ability to handle a maximum of 64K (RAM and ROM). By banking the BASIC interpreter out of the memory map it is possible to use 52K from machine code.

The BASIC is just plain old CBM BASIC version 2, with no graphics, sound, or function key commands added. The graphics and other functions are accessed through a series of POKE statements, making the computer's 'Gee Whiz' features absolute pigs to use. This is probably the only major fault in an otherwise excellent machine.

It is possible to overcome this problem by spending an extra \$80 on the 'Simon's BASIC' cartridge, which adds to the BASIC interpreter. Nevertheless, Commodore should have included graphic extensions in the basic price (it appears this a deliberate marketing strategy, to make just about everybody pay an extra \$80).

The BASIC also supports extremely sophisticated I/O work, and can handle sophisticated cassette files. All I/O work operates by either opening a file to an I/O device and using standard file output (PRINT#, INPUT and so on), or by using the save, load, verify or other statements. (The same statements work with both cassette and disk. Disk commands are suffixed by an '8', since the disk drive is device #8.)

For example, to print something on a printer, you could use OPEN 1,4,0,

A User's View

'STRING' (opens file number one) to address a serial bus printer (device 4) in upper case only (file type 0), and then PRINT#1, 'STRING2' (prints 'STRING2' to file number one). To print out on a printer, you can also use CMD (which is the same as PR on the Apple) to divert all screen output.

The kernel contains the operating system, including the bootstrap routines, cassette I/O routines and so on. These routines are all accessed through a jump table, which is identical to that of all previous Commodores (excluding the old ROM PET) and helps with compatibility for non-graphic applications.

Documentation

The 'Commodore 64 User Manual' is a 166-page tutorial-type book. It includes an introduction to BASIC as well as some of the more advanced features of the machine.

Any experienced user would also require the 'Commodore 64 Programmer's Reference Guide'. This 486-page manual probably should have been included with the machine, but is still worth the extra \$22. It includes virtually everything anyone would need to know about the machine (full memory maps, circuit diagrams, details of the I/O ports and so on). The only notable absence is a ROM listing, which not many people would use anyway.

Conclusion

The Commodore 64 provides good value for money, and although there is a bit of a software drought at the moment, this is sure to break soon.

As a home computer, the C64 could almost be described as too powerful. For example, you must set *eight* settings



The Commodore 64 — good value for money.

before you can produce one musical note, which is a bit beyond the average home computerist (and a few hobbyists like me; I had to see a music teacher to figure it all out), who does not know (or

care) what waveforms and ADSR ratios are. However, the C64's excellent graphics and large memory are sure to make it a useful computer for both hobbyists and small businesses. ☐

Specifications and Report Card

Unit:	Commodore 64
Made by:	Commodore Business Machines
Processor:	6510A (6502-compatible)
Clock speed:	1 MHz
RAM:	64K (38K from BASIC)
ROM:	20K
I/O:	See text
Languages:	BASIC, Logo, Pilot, others coming
Keyboard:	Full QWERTY, no numeric pad
Display:	40 by 25, colour
Graphics:	320 by 200 pixels; 16 colours
Peripherals:	170K floppy disk; printers, etc.
Expansion:	See text
Best points:	Sprites, low price
Worst points:	Incomplete BASIC

Ratings	Excellent	Very good	Good	Poor
Documentation (supplied):			•	
Documentation (available):	•			
Ease of use:			•	
Functionality:	•			
Support:	•			
Value for money:	•			

Price: \$499 rrp (basic unit only)

57344-65535	8K KERNEL ROM OR RAM	E000-FFFF
53248-57343	4K I/O OR RAM OR CHARACTER ROM	D000-DFFF
49152-53247	4K RAM	C000-CFFF
40960-49151	8K BASIC ROM OR RAM OR ROM PLUG-IN	A000-BFFF
32768-40959	8K RAM OR ROM PLUG-IN	8000-9FFF
16384-32767	16K RAM	4000-7FFF
0-16383	16K RAM	0000-3FFF

Statements, Functions and Commands in Commodore BASIC

ABS	COS	GET	LEN	OPEN	REM	SPC
AND	DATA	GET#	LET	ON	RESTORE	SQR
ASC	DEF FN	GOSUB	LIST	OR	RETURN	STATUS
ATN	DIM	GOTO	LOAD	PEEK	RIGHT\$	STEP
CHR#	END	IF... THEN	LOG	POKE	RND	STOP
CLOSE	EXP	INPUT	MID\$	POS	RUN	STR\$
CIR	FN	INPUT#	NEW	PRINT	SAVE	SYS
CMD	FOR... TO					
	... STEP	INT	NEXT	PRINT#	SGN	TAB
CONT	FRE	LEFT\$	NOT	READ	SIN	TAN
TI	TI\$	USR	VAL	VERIFY	WAIT	

Reach For The Stars!



Reach For The Stars is the latest game by Australian programmer, Roger Keating, and the first from an all new, all Australian company, Strategic Studies Group. The game, currently available for the Apple II and IIe and the Commodore 64 computers, is a strategic-level simulation of galactic colonisation, exploration and expansion. Greg Whiley reviewed it for us.

SINCE 'REACH for the Stars' is played in a finite, wrap-around universe, it will come as no surprise to those even remotely attentive to history that these colonial activities produce conflict. The object of the game is to project your military power in such a way as to safeguard your planetary colonies, wherever they are, and to deny or restrict opportunities for opposition expansion, while taking over as much of the

galaxy as possible. Of course it sounds easy enough written down like that, but there are a few details to consider.

The first is that there are always four players, who can be run by any mixture of human and computer controllers. This means that as a player you do not have a single, conveniently designated enemy, but three potential ones. If you are rash enough to attack all three, you could well expect to have the compliment returned by all of them. On the other hand, leaving them alone has absolutely no guarantee that one or all will still not attack.

Other points to consider include the acquisition of the necessary military power. The galaxy consists of 54 star systems containing from zero to three planets. The player starts with one star system containing one planet. Each colonised planet produces industrial output calculated in resource points. These resource points can then be invested to increase industrial capacity, improve planetary environment (increasing the potential population capacity), increase technological and hence military

capabilities or to build colony transport and/or warships.

It is essential right from the start of the game to provide a balanced and coherent management of your economy. Industrial capacity, population and social level all contribute to your output. Points not spent by the planet that produced them go into a global pool available to all your colonies. These are essential to support fledgling colonies and to provide a reserve of military potential in case of attack. This produces a number of conflicting choices that must be successfully resolved at each production turn, hopefully according to a long-term strategy.

Having colonised a few planets and developed some industry and warships, the question then arises of what to do with them. This is not a trivial question. It is a sad but pertinent factor of the game that taking over an existing colony in which someone else has invested a lot of resources is often much more attractive than developing your own from scratch. This becomes more apparent as the game goes on, as all the more attractive development prospects are

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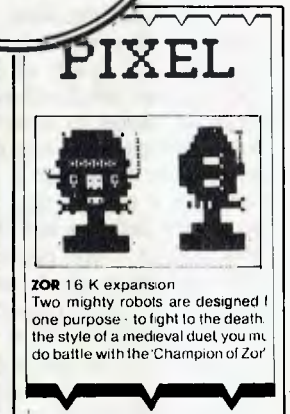
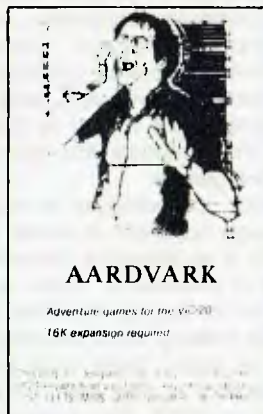
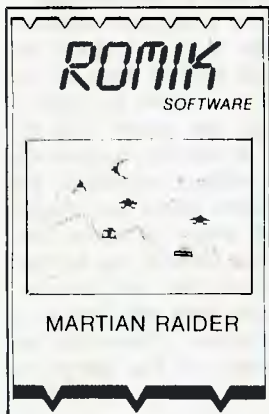
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taken. Your planet could be the victim of a neat cost/benefit analysis that could manifest itself as a massive invasion fleet from anyone, anywhere, any time.

As it turns out, about the easiest thing in the game to do is to take over a planet. If it is unowned, simply take along your transports loaded with people and it becomes yours. If the planet is already owned then you merely have to increase the number of escorting warships to deal with the opposition. Since there is a limit to which you can fortify a planet, it is difficult to totally prevent a planetary takeover. While it is (relatively) easy to invade, the trick is to hang on.

How The Game Proceeds

It should help at this stage to talk about how the game plays. Each odd-numbered turn has a production phase followed by a movement phase. Even-numbered turns are movement only. In the production turn the player makes all decisions regarding allocation of resource points, such as industrial investment, building warships and so on. At this point in the game you can ask the computer for its assessment of how you should tackle your production, something that is very helpful when you are a novice.

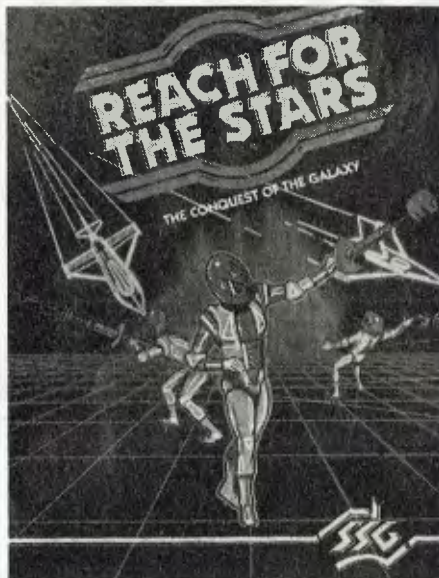
In the movement phase ships can be formed into task forces and given destinations. There are three different ways to set a task force objective, two of which give you control over a cursor, and the third involving naming the destination system. A nice touch is that you only have to type enough of that name to form a unique destination and the computer will recognise it and fill in the rest.

Combat occurs when opposing fleets end the movement phase in the same system. One round of combat is mandatory, after which either side may withdraw. A series of combat rounds continue until one side has either withdrawn or lost all its ships. If you defeat the ships in a system you may attack the planetary defence bases of a planet in that system. If you destroy all the bases you may either attack the planet itself or invade it by landing colony transports.

The point should be made that the mechanics of the game are fairly simple. The computer takes all the hard procedural work out of navigation and combat, making staff work as easy as possible. After a few games you will almost never need to refer to the rule book, and this simplicity only enhances the subtlety of the game itself.

Moves Fast

A couple of comments need to be



In *Reach For The Stars*, taking retribution against attackers can be effective ... but sometimes you should be nice to people.

made here about the way the computer itself affects the playing of the game. The first is that it thinks very fast. It takes a very short amount of time to make its own decisions and displays the results of your decisions instantly. This is a marked and very welcome contrast to a lot of other computer wargames, which are quite slow and hence frustrating to play. RFTS is so fast because all the programming was done in machine language. This factor will be appreciated by anybody who has played a game written in BASIC.

Even more important than the speed is the fact that the computer is extremely smart. Computer opponents come in three grades: Beginner, Experienced and Veteran. A Veteran computer player is just that – a very, very tough opponent, more than a match for beginners or even those mortals who have played quite a few games.

However, the computer is more than just a tough opponent, it is also a smart one. This is an important distinction, because it is possible to make computer opponents in games like this tougher simply by making them harder to kill in combat or giving them more points or better planets to play with. This is not the case in RFTS. The computer competes on equal terms with the players.

This point can be illustrated further. In RFTS the computer is so smart that it would not be possible in a blind test for a human player to consistently and reliably work out which of his opponents was a computer player. This would hold true even for experienced players, a

number of whom were asked about this and who gave themselves little or no chance of making the distinction.

This behaviour is like an application, in a strictly limited context, of the famous Turing Test for artificial intelligence. Obviously, the computer in RFTS is not exhibiting a general intelligence but merely doing very well in a restricted environment. This can be compared to computer chess games which are also quite smart. However, unlike chess games on the Apple, RFTS makes its decisions in seconds rather than minutes. Again, this intelligence factor compares very well with a lot of other wargames on the market.

Decisions, Decisions

The decisions required of the player of RFTS are both strategic and tactical. The strategic-level decisions are basically investment decisions; scarce resources must be allocated amongst competing requirements. In this light the decision to colonise or take over a planet is a major investment decision.

The tactical decisions concern the disposition of your military power; protecting your investments is not an easy task. Information is also limited. Basically, the first you will know of an attack is when it actually hits you. This requires some flexibility in your defence and suggests that some form of retribution might be equally effective.

It should be clear by now that at no time in the game can any player afford to relax, as it could happen that two or three people could effectively gang up on another player without either the victim or the perpetrators knowing about it until it happened. So maybe you should be nice to people after all (sometimes).

The main flaw in otherwise reasonable documentation is that it does not give you any great idea of what sort of general strategy is required to make a reasonable go of the game. For instance, the level of warship technology is crucial to the military aspect of the game. In a forty-turn game you should be using Mark II ships by about turn twelve. In the Apple version you are not explicitly informed of this, and the discovery will probably take the form of a series of painful losses. Thankfully the Commodore version of the game includes this and other useful information with the rules.

In summarising, *Reach For The Stars* is an excellent game. It is fast and intelligent, and the game mechanics are simple but the strategy required is quite devious. Add to this the natural strengths of a game employing four people in subtle, but all-out competition and you have a winner. □

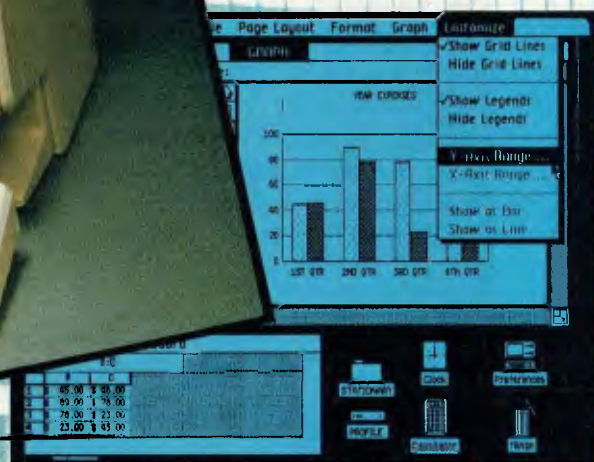
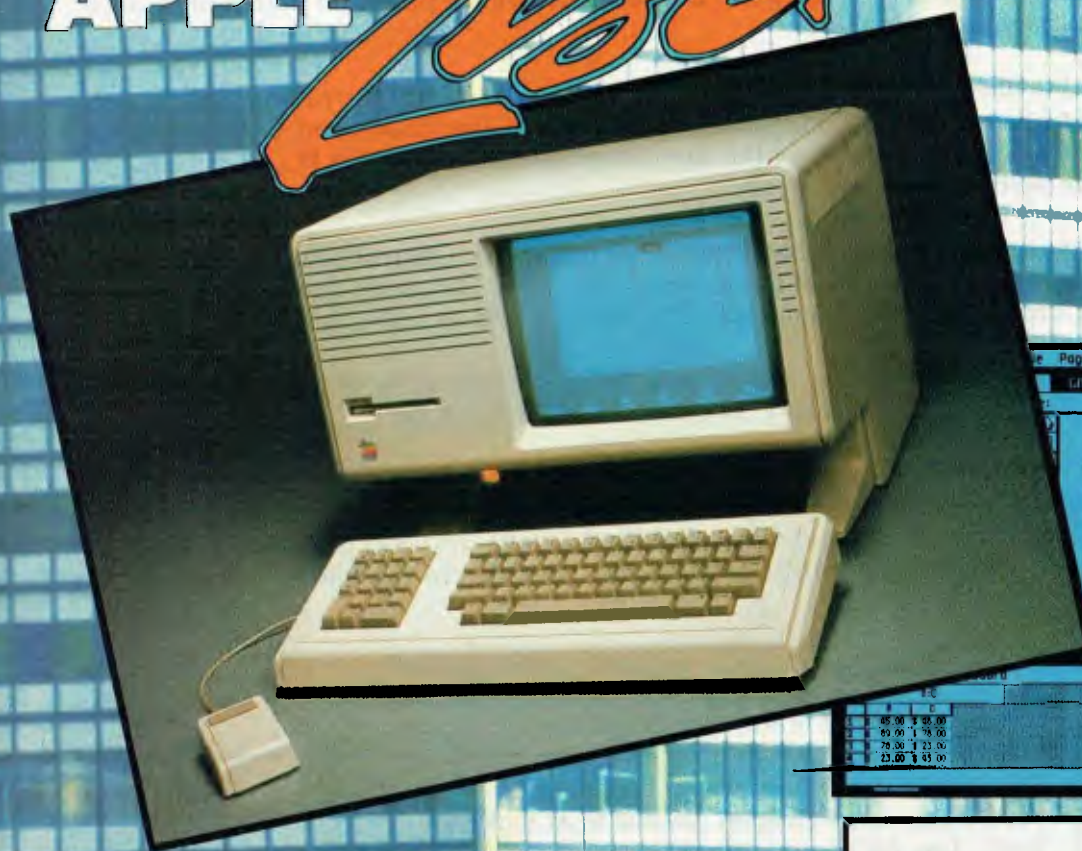
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Last year the Conference was addressed by senior executives from IBM; Computerland Corp.; Apple Computer Corp.; Micropro International; Digital Equipment Corp; Sord Computer Systems Inc.; Sybex Inc.; Osborne Computer Corp. During the Conference the IBM XT had its world release.

The Society received considerable praise for its initiative in bringing world authorities to Australia at a critical time in the development of the Personal Computer as a business tool.

The 1984 Conference will maintain the high calibre of speaker profile and will be held in Sydney on the 14th-16th of March, 1984. It will be held in conjunction with the PERSONAL COMPUTER SHOW, the most comprehensive personal computer exhibition held in Australia. The cost is \$395 per delegate if booked and paid for by the 24th February 1984 and includes entrance to the Show.

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Apple's Lisa

4

Lisa is probably the first personal computer to have been designed around a new software concept. Les Bell bought one so he could familiarise himself with the latest technology. Here is his user's assessment.

BY LES BELL



Mitch Kapor

10

For Mitch Kapor, co-writer of the Lotus 1-2-3 integrated software package and president of the Lotus Development Corporation, controlling the growth of his rapidly expanding company is his main concern. As this interview shows, he seems bound to succeed.

BY HOWARD KARTEN



The Kaypro II

14

Its portability and its complement of Perfect Software made the Kaypro II an excellent companion for the editor of a book on Australia's rural sector.

BY STEVE KEEN

Learning Wordstar By Cassette

21

Nearly every office or home has a cassette recorder. Now an ear-plug or headphones are all you need to teach yourself Wordstar, learning on your computer at your own pace and without anyone knowing you're not really listening to Beethoven.

BY EVAN McHUGH

Hewlett-Packard's 150

22

Ease of use is becoming an increasingly important ingredient for all new micros. Pointing to menu selections on the screen is the simplest way yet of operating a computer.

BY LES BELL

Wang-Style Word Processing

26

Wang dedicated word processing systems are well known. Two recently released packages, one for the Sord and one for the IBM-PC, have unashamedly copied the Wang style.

BY DOM SWINKELS

GBS Database Management

30

A database management package which runs on various micros, GBS has some rough edges, but will suit certain users.

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Although he already has two computers in the office, there's no satisfying Les Bell. A while ago he started shopping around and finally settled on ... Lisa.

APPLE'S

Lisa

The latest Lisa look, one of three models in Apple's revised range to be released.



Keyboard layout for the Lisa.



The mouse is a little box, with a button on top, attached by a cable to the back of the computer. Moving the mouse on the desktop moves the pointer on the screen. Pressing the button registers the move.

S P E C I F I C A T I O N S

Unit:	Lisa Office System 3			
Made By:	Apple Computer Inc.			
Processor:	68000			
Clock Speed:	5 MHz			
RAM:	1 Mbyte			
ROM:	Bootstrap and diagnostic			
I/O:	two serial, one parallel + 2 x parallel on I/O board.			
Languages:	Pascal, COBOL, BASIC-PLUS, CLASCAL			
Keyboard:	Full QWERTY plus numeric/cursor			
Display:	Very high resolution bit-mapped			
Graphics:	Very high resolution bit-mapped			
Peripherals:	Dot matrix printer, daisy wheel printer			
Expansion:				
Best points:	Powerful, integrated software			
Worst points:	Bit on the slow side			
Ratings	excellent	very good	good	poor
Documentation			•	
Ease of Use	•			
Functionality		•		
Support			•	
Value for money				•
Extras included:	Dot matrix printer			
Options:	Lisa Terminal program, languages			
Price:	\$10,395 + tax (including printer and applications programs).			



For quite a few years now, I've been working on CP/M-based computers, since they have had the widest selection of tools and general software. However, in the last year, it has become evident that CP/M is no longer the only operating system for personal computers and that other systems offer their own advantages.

The worst thing a technical writer like myself can do is fall behind the times, so in recent months I have been increasingly concerned with finding the appropriate means of keeping up to date. My office is well catered for with CP/M machines — we have a Morrow/Godbout system and a Kaypro — and we will continue to work on these kinds of 8-bit CP/M systems. However, there are more things in heaven and earth than are dreamt of...

In particular, I was concerned to get up to speed in UNIX, which is shaping up to be one of the major operating systems for the late eighties. Similarly, I needed to find out more about object-oriented systems like Smalltalk and Logo. I needed to make the jump away from the 8080 family of processors to the 68000 and similar, and finally, I wanted to have excellent presentation-quality graphics.

After a lot of searching, I came to the conclusion that the machine for me was Apple's Lisa. Of all the machines on the market, it is probably the most different from those I am familiar with. Consequently, it has provided a completely new experience to make me rethink my approach to personal computing.

Simply Stunning Software

Lisa is probably the first personal computer to have been designed around a new software concept. It's not the hardware of Lisa that is stunning — although that is impressive in its own way — it's the software.

The Lisa software is simply stunning in the elegance of its design. It is easy to use, yet powerful, and relies heavily on full integration of all its functions.

Lisa works by metaphors. The screen is — metaphorically speaking — a desktop. That's what it looks like at first power-up: most of the screen is grey, with objects arranged around the edge. Typi-

cally, there's a ProFile mass storage unit, a representation of Lisa itself, a clock, a calculator, clipboard and wastebasket. There may be others.

In fact, these are not really objects at all, but merely symbols representing the real objects, which are on disk or in the memory of the computer. These symbols are called icons.

At the top of the screen is a menu bar, the contents of which vary according to what you are doing. Right now, as I write this article using the LisaWrite editor, the menu bar says

File/Print Edit Search Type Style Format Page Layout

but as I shift around, doing various things, that will change.

Word Processing

The LisaWrite word processor, which I am using to write this article, makes first-generation WP systems look like Heath-Robinson kludges. What you see with this system is exactly what you get, right down to the type style and size. The Lisa screen is a bit-mapped graphics system, and so can display a wide range of typefaces precisely. These include 15 pitch Gothic, 12 pitch Modern and Elite, 10 pitch Modern and Courier, proportional spaced Modern and Executive, and both 0.6 cm (1/4 inch) and 0.85 cm (1/3 inch) Modern and Classic. All these faces are available in bold, italic and with underlined enhancements, as well as super- and sub-scripting.

Documents can be printed on either the Apple Dot Matrix printer or on the Daisy Wheel printer. The latter uses a special daisywheel which has the full Lisa character set on it. Incidentally, the Daisy Wheel printer can handle graphics printing as well, though it's not as fast as the dot matrix printer.

Editing is performed by using the mouse to mark text. Holding the mouse button down and 'dragging' the mouse through some text will mark that text; clicking twice will select the current sentence; while clicking three times selects a paragraph. Then, selecting the Edit choice on the menu bar will reveal the editing options — cutting the text out,

copying it, pasting text into the document at that position, or undoing the last change. The undo option is particularly helpful for the first-time user.

Cutting and pasting is the main way of moving text (or any other material) around in a document or between documents. When material is cut or copied, it is transferred to the clipboard, one of the icons at the lower edge of the desk. Pasting transfers it back out again, wherever the mouse happens to be positioned.

The important point to bear in mind about cutting and pasting is its generality: not only does it work consistently within any one application, but it also transfers material between windows. For example, a manager using LisaProject may notice that part of a project schedule is slipping and wants to send a memo to light a fire under the appropriate subordinate. He can use LisaWrite to compose the memo, and then copy the schedule chart from LisaProject to LisaDraw, to highlight the areas for attention. Finally, he can paste his memo into the LisaDraw document and print the whole lot together.

Similarly, graphs produced by LisaGraph can be enhanced using LisaDraw. LisaCalc spreadsheets can be incorporated into LisaDraw documents and so on.

Spreadsheet Calculating With Lisa

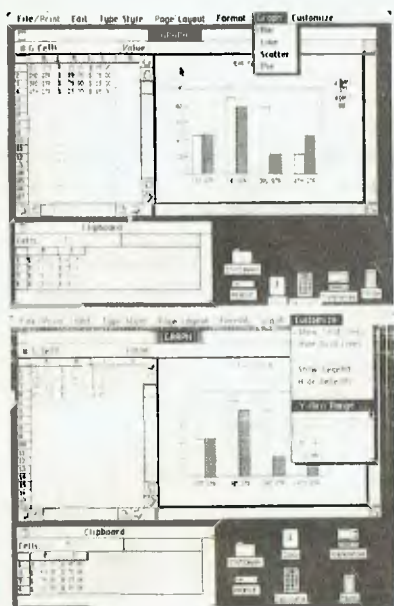
LisaCalc is a spreadsheet calculator program, which in terms of its capabilities is not that special, but in terms of the user interface is very special, since it is similar to the other Lisa software. In particular, the complex concept of replication is handled simply and elegantly, as an extension of 'copy and paste' to 'copy and paste adjusting'. The mouse can be used to mark groups of cells, cut and paste and perform other tasks.

The size of the LisaCalc spreadsheet is 256 x 256, which does not sound like a lot until you realise that sheets with a theoretical maximum of thousands of rows or columns never reach that maximum since they run out of memory. LisaCalc is a true 256 x 256 sheet. It has a full complement of functions, and in particular, the ability to calculate with dates.

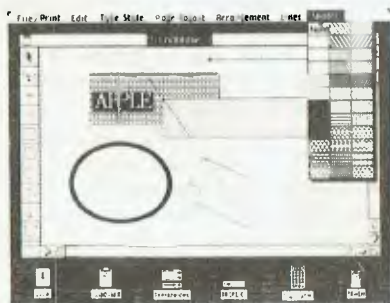
LisaCalc has no graphics functions, a



la VisiCalc's columns of asterisks. Instead, the user copies a range of cells to the clipboard and then pastes them into a LisaGraph sheet, whereupon a graph almost magically appears. This tool (Lisa's programs are properly called tools) can plot line, bar, pie and scatter charts. Naturally, these graphs can be directly printed on either printer, and they can be transferred to LisaDraw for further customisation.



A sample printout of Lisagraph.



A sample printout of LisaDraw. This package allows the user to draw virtually anything on the screen, but is used primarily for business graphics, charts and building plans.

Drawing Capability Is A Gem

I've mentioned LisaDraw a couple of times; it is one of the jewels in Lisa's crown. This package allows the user to draw virtually anything on the Lisa screen. It's of most use for business graphics, such as organisation charts and building plans. Down the side of the window is a palette of shapes which is used to draw various kinds of objects. At the top is a pointer shape which is not used for drawing, but to select objects and move them or make them grow, shrink, or whatever. A text pointer allows entry of text (in all the usual type-faces) with automatic centering.

The next pointer allows vertical and horizontal lines to be drawn, while the next is for diagonal (rubber-band) lines. Then come a couple of pointers for drawing boxes, with or without curved corners. A box is drawn by pressing the mouse button on one corner, moving to the opposite corner and releasing the button. A similar technique is used to draw circles and ellipses inscribed inside an imaginary box. This is all much more difficult to describe than to do, I might add.

The last three pointer types allow drawing of arcs, free-hand curves and polygons. Curves can be smoothed, their shapes edited, and lines can be any of four thicknesses in black, grey or white. Enclosed areas can be filled with one of 36 different shading patterns. This gets around the simplistic (and somewhat gratuitous) criticism of Lisa – what about colour?

Complex shapes can be built up from the simple shapes and then grouped so they can be treated as one. In this way I was able to construct a library of logic symbols, such as NAND and NOR gates and start drawing circuit diagrams – without reading the manual, which is another testament to Lisa's ease of use.

LisaList is a simple list management program, which allows the user to set up fixed record-length files and sort and select on various fields. With other relational databases around the office, such as dBase and RBase, I haven't really got much use for this program and so haven't played with it to any great extent. Of all the Lisa software, this program seems to be the least well inte-

grated, both in terms of user interface and of ability to cut and paste data to other tools.

Project Managing With Lisa

Possibly the most dramatic demonstration of Lisa's capabilities is LisaProject, a project management package based on CPM (Critical Path Method) principles. The user simply draws the project network in exactly the same way as if using LisaDraw. He names each activity, and gives details of the resources (people or equipment) required, together with the duration.

From this, LisaProject will calculate the start and finish dates of each activity, together with the completion date of the entire project. The program detects competition for resources, and will produce charts showing, for each resource, the activities it is scheduled for. It will also produce a GANTT-style chart showing activities against time, together with slack time.

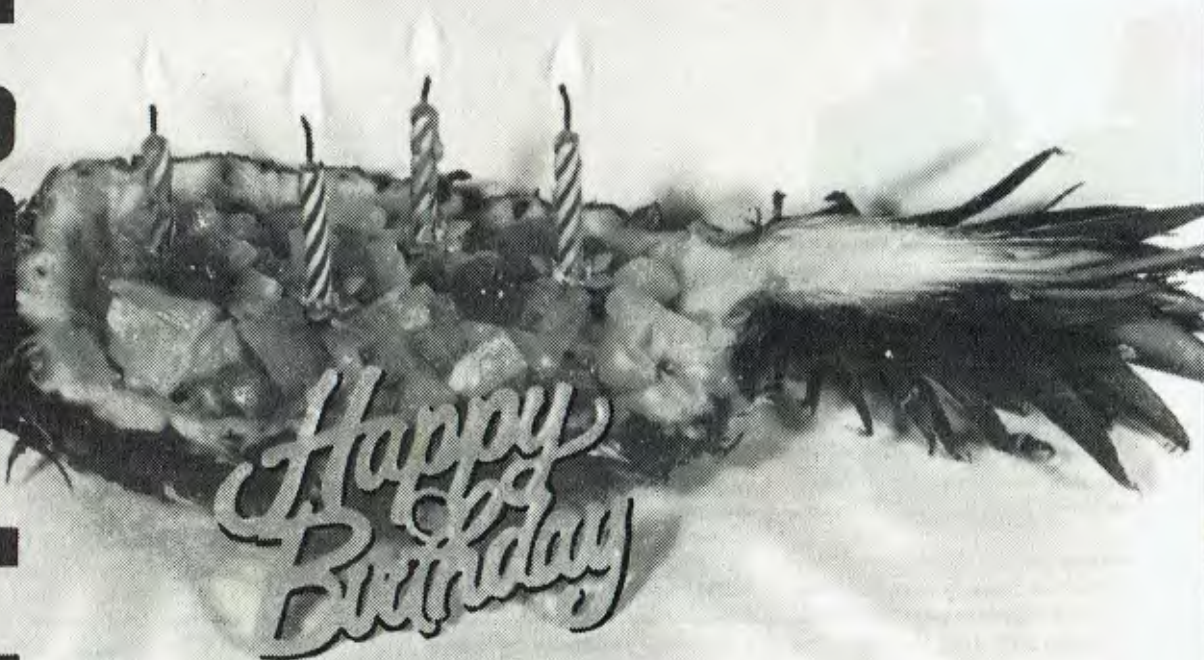
The whole program is deceptively easy to use and very powerful. It automatically takes account of working days and holidays, and can handle up to 100 tasks, starting on any day. The maximum drawing size is 32 square feet!

Mice Are Nice

The way the user controls all this is with a gadget called a mouse. Mice are all the rage this year – almost every personal computer will have one – but few could begin to compete with the Lisa. The mouse is a little box with a cable (the tail) running to the back of the computer, and a button on top. Underneath it has a mechanism based on a rubber ball which senses the movement of the mouse on a desktop. Moving the mouse also moves a pointer on the screen. It feels a little strange at first, but after a little practice it becomes natural.

To work with objects, you simply point to them with the mouse, and click the button. To select actions, point to the menu bar and press the button, holding it down. A 'blind' will drop, revealing further selections. Move the mouse down until your choice is displayed in reverse video, and it will be performed on the selected object. (If no object is selected, nothing happens).

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To see what is on the ProFile hard disk, you select its icon by clicking the mouse on top of it (it turns black to confirm the selection). You then move the mouse to the File/Print selection on the menu bar and press the button, dragging the mouse down until the choice 'Open "Profile"' is highlighted, and release the button. The ProFile icon will seem to fly open, expanding to fill a larger window which then shows the contents of the device.

The contents of the ProFile (or any other disk) can be either folders or sheets of 'paper', or tools (programs). Sheets of paper are documents like the one I'm writing now, and can contain text or graphic information. Folders are different – they can contain other folders or files. In a sense they are like the hierarchical file directories of UNIX or PC-DOS 2.0. However, they are a lot simpler to master.

To move a document into a folder, that's exactly what one does – pick up the document by pressing the mouse button on top of it, and holding the button down while moving the pointer to the desired folder. The outline of the document will follow, and once it is over the folder, releasing the button will complete the transfer.

Easy To Master

Most of the Lisa commands work in a similarly intuitive fashion; only rarely does something work in an unexpected way. This leads to the Lisa paradox. Many journalists have played with Lisa for an hour, maybe a couple of hours or so. They come away thinking how nice it is, but that there is a sad lack of commands to do various tasks. They think, 'I wonder how I could get it to do this?', trying to come up with command sequences to do the job.

The paradox is that there is virtually no more to learn than they already have. After playing with Lisa for a while, one becomes disappointed that there is nothing more to discover. For the business user, this is a definite advantage: there is nothing left to do except work, and the user by now has the skills to do that.

Working with Lisa has convinced me that Apple's claims are correct: Lisa is easier to work with than other personal computers. The result is higher produc-

tivity and more positive motivation to use the computer.

Lisa's software is totally integrated and modeless – that is, the available commands work the same way regardless of which software package is running. There are seven packages currently available, covering the majority of office automation tasks (see Table 1). After completing the LisaGuide training course, it is possible to use virtually any of the software immediately.

Other Good Points

Lisa also has some other utilities, such as a desk-top calculator which is operated by clicking on its keys, and a real-time clock. Just released is a communications utility called LisaTerminal, which provides emulation of DEC VT-52 and VT-100 terminals at up to 9600 baud. I've been using this one as a remote terminal to my S-100 system, as well as to log on to bulletin boards, and it works fine. It really is nice to watch incoming listings on the LisaTerminal window while running LisaWrite in another.

The desktop operation is fascinating to watch. For example, it is possible to switch Lisa off while several windows are open. The on-off button is not 'live' – it simply signals to the processor that you want to switch off. Lisa will then tidy up the desktop, putting the various files away, and switch itself off. When switched back on again, Lisa will restore the desktop to its previous state.

Nobody's Perfect

There are a couple of things that are less than perfect about Lisa. For example, it's sometimes slow in operation – largely due to the speed of the ProFile hard disk interface. The trick is to alter one's way of working: a tidy desktop actually operates slower, as files must be opened and closed. By simply setting documents aside on the desktop, operation is considerably faster. This is intuitively obvious for a first-time user, but for a computer literate, it is less clear and requires an understanding of the virtual memory system which underlies the Lisa Smalltalk-style software.

Lisa supports a variety of programming languages, but these are only now starting to become available. All the languages – Pascal, COBOL and BASIC –

PLUS – operate in an environment called The Workshop, which is apparently similar to the UCSD p-system. They are thus not well integrated with the Office Manager software which runs the other applications. However, a new language will shortly be released, called CLASCAL, which combines the features of Pascal and Smalltalk, and this should bridge the gap.

Lisa And The Third Party

As well as being able to run Apple's standard software, Lisa can also run third-party software. Microsoft's XENIX is available, for example, as is the Unisoft UniPlus+ UNIX. Both of these are multi-user systems, allowing two external terminals to be attached to the serial ports on the back of the Lisa. A single-user version of UNIX is also available, at only US\$495.

A wide range of software is available to run under UNIX, including database management systems, word processors and typesetter drivers. For those who are migrating from the CP/M world, CP/M-68K is expected to be available shortly – at least, every photograph I've seen of Gary Kildall recently has had him posing in front of a Lisa, so something must be happening. It's taken so long to appear, after the generic version of CP/M-68K that I'm tempted to conclude it must have some interesting extensions to take advantage of the Lisa hardware.

In Conclusion

In summary, I am now convinced that Lisa represents the wave of the future. The software is incredibly easy to use and powerful in a productive sense. It's so easy to use that when I went on holidays I left Lisa with our illustrious managing editor, Matt Whelan, and he promptly drew up the floorplan for his new house – again, without reading the manuals!

This computer is not for everyone – it's strongly business-oriented and is quite expensive. Mind you, just under \$8600 is not a bad price for a 68000-based machine with a megabyte of memory, real-time clock, two floppies and a hard disk, together with a high-resolution bit-mapped graphics display (that's excluding the applications software and printer).

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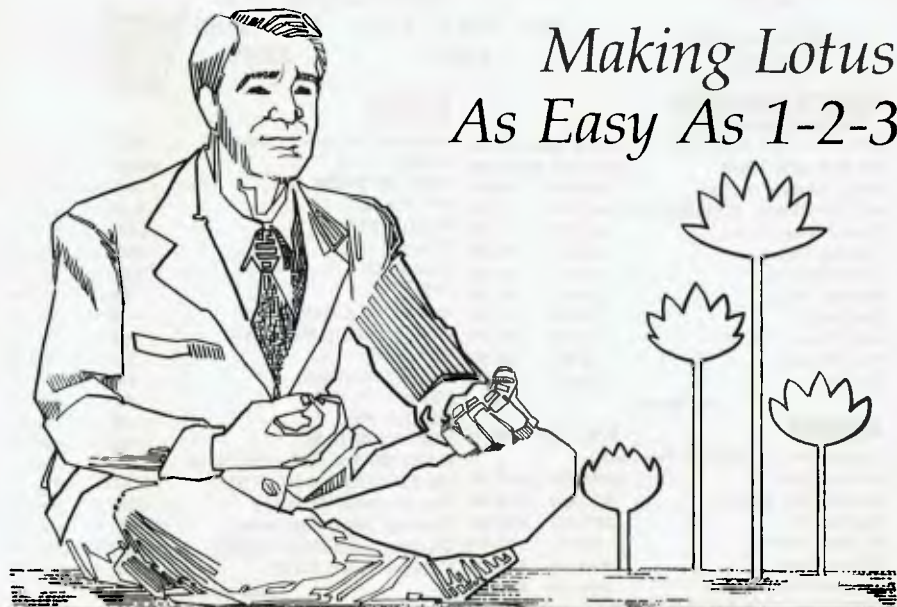
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Howard Karten, our US correspondent, interviewed Mitch Kapur, co-writer of the Lotus 1-2-3 integrated software package and president of the growing Lotus Development Corporation.

Making Lotus As Easy As 1-2-3



MITCH KAPUR



The data processing industry has always been characterised by buzzwords. Currently in vogue is 'integrated', referring to software for microcomputers that combines several functions, such as a database, graphing, and spread sheet ability. The idea is such a product should make it easy for the user to switch from one task to another, and the separate functions should be able to access the same data with a minimum of bother.

One such product is Lotus Development Corporation's 1-2-3. When it was introduced, the Wall Street Journal, which is not given to loose use of words, said "... many enthusiasts believe it is the most significant program in personal computing since VisiCalc ..."

The entrepreneur behind Lotus is Mitchell Kapur, 32. A friendly, straightforward

fellow, Kapur has what he describes as "three-quarters of a masters degree" from MIT's prestigious Sloan School of Management, as well as a master's degree in counselling psychology.

Given Lotus' current situation - a hot product, a company expanding incredibly quickly, much adulation from users and the media, and multiple, competing demands for the company president's time - it would be understandable to find a chief executive particularly impressed with himself, or displaying some less attractive human qualities such as arrogance, impatience, or cockiness.

Kapur has none of these. Depending on what question he's answering, he can be modest, self-critical, playful or pensive. In short, he's the kind of person who would be interesting to talk with on a long plane ride or at a party.

I arrived at Lotus two days before a

scheduled move to larger quarters. The atmosphere was mid-way between frenetic and California laid-back. Boxes of papers, books, computers and so on, filled the halls. At the same time, several shoeless employees were taking a break near the receptionist's desk. One has the impression that although things are hectic, the employees are enjoying their jobs.

Kapur moved out of his original office some time ago, so three employees could be put into it. His current office is best described as non-descript. It appears no larger than any other office, with several stacks of books, papers, reports and so on. The walls are totally devoid of personalised items, such as pictures of Kapur with other business luminaries, or certificates of any kind. There is, in short, nothing to indicate that this is the CEO's office. "I know I'm the president, and the employees know it ..." says Kapur with a shrug, explaining why (in part) he has not availed himself of the trappings traditionally allowed a person of his position.

This is not to say Kapur is diffident or shy. I found him candid and not at all guarded. Top managers in business are often reluctant to publicly criticise their own industry; indeed, there is often an effort to soft-pedal or 'smooth over' pointed questions about industry shortcomings. As the interview shows, Kapur expresses himself openly on this subject.

Our talk was extremely interesting. Kapur has clearly given considerable thought to who he is and what he wants Lotus to be. He is neither driven, nor laid-back. He seems to have a balanced attitude towards his work, and he emphasised that when he's relaxing, his mind is not occupied with work.

I was also impressed that Kapur spoke with me without a public relations person monitoring the conversation. He has some impressive public relations talent on retainer and on the payroll, and individuals in his situation sometimes use a PR person to restrain heady exuberance.

Not so Kapur! Although he expressed himself freely, I heard nothing that could be called 'shooting from the lip'.

Perhaps because we're both ex-New Yorkers, we seemed to hit it off right away. I had initially sought an appointment of 90 minutes (an appointment, in-

"I'd done VisiTrend and VisiPlot which were commercially successful, and I'd made money on them. I think there was substantial evidence that I had design talent, programming talent ... but also a feel for the industry that could translate into a material product."

cidentally, which had to be rescheduled three times before we got together). Lotus' Special Projects Manager gave me a 60 minute appointment, which is the longest block of time Kapor likes to schedule in advance. "Hope that you can interest him in spending more time with you, if you need it", she suggested. I was fortunate in getting nearly two hours of Kapor's time, and a fascinating experience.

The Interview

Where did the idea for 1-2-3 come from?

It was a day when I had been doing some sort of forecasting with VisiCalc, and I wanted to make a graph of the results, which would have involved five minutes of going through a tedious multistep procedure. So, I said to myself, "What I really want to be able to do is have a GRAPH command in VisiCalc, so I can enter the command and have it make a graph." It seemed like a natural combination, and the only reason it hadn't been done was that some early hardware really didn't have enough memory to accommodate all the code it would take to do that.

From having the idea, how did you go about determining the possible market for it?

[Smiles] I wish I could say we did a great deal of sophisticated market research, but that's not the case. We're just beginning to do some now.

Individual packages, such as VisiCalc, word processing, and others were selling at that point. So I had the idea, if you could combine all the functionality in some fashion, you'd really be saving users a lot of trouble and giving them much more power because the programs would co-operate better with each other.

That was the market research! Around that time, I moved back to Boston to finish VisiPlot, and I left the employ of Personal Software. I knew Johnathan Sachs (Lotus R+D vice president), who had the rights and the source code for a spreadsheet product he'd developed for a former employer.

So he had the spread sheet, I knew about graphing, and it seemed reasonable, given the original insight I'd had, to begin building an integrated product with both capabilities. We sort of looked at market needs, in an informal and anecdotal

way, and decided that combining multiple functions was a good idea. So, after some prototyping and initial design and trying different things, we decided to include a database.

But there must have been plenty of people who had that kind of idea ...

Yeah. But it's all execution. It's similar to what Edison said - genius is one per cent inspiration and ninety-nine per cent perspiration. I won't use the word 'genius' about us, but that's what it comes down to.

Getting the Capital

What was it that sold a high-powered venture capital outfit such as Sevin-Rosen partners on you specifically, and on your idea?

First on the list, I guess, was track record. I'd done VisiTrend and VisiPlot which were commercially successful, and I'd made money on them. I think there was substantial evidence that I had design talent, programming talent ... but also a feel for the industry that could translate itself into a material product. There were not, at that time, all that many hit products and I had one of them (VisiPlot), so that certainly accrued to my benefit.

John Sachs and I also had a coherent business plan. We understood pretty well who our market was going to be, and how we were going to sell the product. That was enough. Sevin-Rosen looked not necessarily for the absolute best opportunity, but for one that had a measurable and acceptable degree of risk.

And to tell you the truth, even though there was so much uncertainty about what we were going to do, while you will find many people who are likely to excel in any one given area, our whole approach, which had been reflected in my conversations with Ben Rosen about the company, was to excel in all areas - in marketing, in technology and in management. We needed the venture capital for the financial strength. So we had a vision, not just of doing a product, but of building a company, right from the beginning.

Now that vision of the company has evolved, but I think that's one thing that differentiated Lotus from the very beginning from other people who were bright and had a good idea.

I really wanted to build a company. I'd

already built products - that was no longer a challenge. The challenge was to build a company, and the way to do that is to build the right product first, and build the company around it.

The whole spirit of discussion was, 'We've already accomplished these things, and now here is a plan that says we'll do such and such.' We approached this in an entrepreneurial spirit, not as hackers with an idea.

Broad Experience

So it was more that you had a broad vision, rather than just an idea for a product?

I think so. And also, in a very young industry, pretty broad experience is important. Having been an author, program designer, product manager and so on, I'd been a number of places and seen how many things operated, and we really felt we could benefit from the mistakes of other companies.

The other important point is, many of these things took place when the IBM-PC was first announced, and we saw a strategic opportunity. One of the principles embodied in 1-2-3 was that we would customise or optimise the product to take advantage of the IBM-PC, which we viewed as having superior capabilities to the other microcomputers then dominating the market.

We felt that people were starting to approach the limits of the hardware, it's speed and memory capacity. If you designed a product to take advantage of 16-bit architecture, you really had a strategic advantage; particularly given the fact that our guess, which has since proven to be correct, was that it would take companies with existing 8-bit products far longer to convert them to native 16-bit, as opposed to just porting them up.

Controlling A Monster

What, if anything, has surprised you most about the reception 1-2-3 has received?

The magnitude of it! [laughs] We wanted to have a hit product. We didn't know, and could not reasonably have expected having a monster. Lotus 1-2-3 has turned into a monster: a dominating software product that stands to the IBM in a somewhat similar fashion as VisiCalc to the Apple II.

"... it's all execution. It's similar to what Edison said – genius is one per cent inspiration and ninety-nine per cent perspiration. I won't use the word 'genius' about us, but that's what it comes down to."

What are some of the problems of having such a monster on your hands?

The biggest problem is one we actually anticipated – controlling explosive growth in the company, which we deal with every day. Others were hiring, and organising the different functions that must continue. The biggest challenge is not to choke on our own success, to avoid becoming arrogant and defocussed by pursuing too many opportunities, because everyone wants a piece of something that's hot. You have to maintain your own centre of gravity. It's very tempting to go off and do all sorts of things.

Growth tends to be self-limiting in entrepreneurial situations where you have a hot product in a hot market, and there's no question that that's what we're in right now.

Keeping In Touch With Users

What special techniques do you use to avoid arrogance, and to keep in touch with your customer base and remain responsive to it?

There are formal and informal methods, and, in the long run, the particularly important ones are informal. It's also both necessary and appropriate to do things more formally. So, we have ongoing focus groups for our users in which we get a bunch of users in a room with our technical and marketing people, sit down, and find out what they really think.

Are there any other techniques which are helpful to you in staying in touch with user thinking?

Every week, the people who work the hot line log all the comments, feature suggestions, and big problems of users, and I read those comments. The technical people and I review them, which is one way of staying in touch with what people are saying to us.

A professor at MIT's Sloan School has observed that customers and users are often far more creative than vendors when it comes to extending the uses of a product. Have you found that to be the case with 1-2-3?

[Emphatic] Oh, yes. For example, people who use VisiCalc as a word processor. The market is not dumb, but it's not necessarily articulate in any general

sense. Sometimes users don't have the back ground, framework or vocabulary, but we never, never, never underestimate users. Tons of good suggestions and procedures have come in from them, and people at Lotus often say, "What a great idea!", and then the idea goes into the next release.

Future Product Developments

Can you tell us anything about the follow-on products you're working on?

Only what I've said before! A legitimate criticism that's been made of 1-2-3 is it failed to address the issues of word processing or communications, and that the database is not as 'robust' as it could be – that it doesn't have enough features and power. We started out by providing an integrated productivity solution that focused on certain applications. The goal, for a product to be released in 1984 – which, incidentally, will have price protection upgrading for all existing users – would be to come out with a product that maintains the style and feel of 1-2-3 (the speed, the power and the convenience), but which dramatically expands the functionality into areas where it just isn't today. Clearly this would be in word processing, communications, and in the ability to send and receive data between PCs, mainframes and database.

We expect to be talking about that more in the fall.

An Eclectic Background Helps

You have a background your own staff has called 'eclectic'. You've been a disk jockey, you have a master's degree in counselling psychology, you worked in a psychiatric ward, you've been a programmer, and several other somewhat unusual things. To what extent has this background helped you found Lotus and bring it to where it is now? To what extent is your success due to the fact that you're not a grizzled, 20-year veteran of the industry?

Having an eclectic background has helped a great deal. My psychology training, and my work in human services really helped me sharpen a feel for people, I think.

With product design, you've got a man-machine system. So, the name of the game is making the personal computer easier to use, since our target mar-

ket is non-programmers. Therefore, intuitively understanding how a non-programmer thinks – which is how I think – really helps in designing products which are genuinely easy to use.

As for the management issue, there is a direct transfer of many group skills and communication skills from my counselor days which are really applicable to the management process.

Given your own diverse background, is cross-fertilisation of technical and marketing people one of the key things you look for in hiring people?

Absolutely.

Mistakes?

What were the two biggest mistakes you made in the early days of Lotus?

The first was a lack of self-confidence. I really thought that other people had so much more 'X' – experience, management talent, design ability, whatever. So I was hesitant and unable to make any major moves. Lotus could have started one year earlier, but I wasn't ready. [reflective] I don't know if that qualifies as a 'mistake'...

Now, of course, I have to watch out that we don't swing to the other side. If I have a weakness, or an area that I need to watch carefully, it's in balancing those two attitudes.

The other biggest issue would be that I still find it hard to say no ... I guess I want everyone to love me, but of course you really can't run a business like that, so I think I've made mistakes where I said yes to things that I've regretted – because my heart wasn't really in it, but I'd made a commitment.

Growth As A Problem

What are some of the problems you face with growth of the order that Lotus has experienced?

[Laughs] Where to put people. If you start from ground zero, which we did, then there are problems of just bringing people into the company; space management, getting people the right equipment, introducing people. If you don't pay the right amount of attention to setting up the structures early on, which we did, then you find people are kind of swimming around. They're lost, they don't know what their job is, or who they're working for, or what they're



supposed to be doing, and they may not even have a place to sit down and do it!

Attention to fundamentals can help there. Similarly, there are some new companies that keep their records in shoeboxes, which can cost them hundreds of thousands of dollars and delay their plans when they have to take time to correct the financial mess of record-keeping and lack of control. We've had those basic systems in place since the beginning. Then, the challenge is, if you're growing at twenty per cent or twenty-five per cent a month in revenues or personnel, you have to evolve systems. You can't put a system in place for a company of X size if you're going to be a 10X size company. You've got to be able to think ahead.

The same thing applies to facilities planning (Lotus moved into a 50,000 square-foot building two days after this interview, and is looking for an additional 100,000 square-feet for 1985).

Is one of the things you're saying, 'Think big'?

Be willing to think big.

You've made the observation that managing a fast-growing company is like conducting an orchestra, except that you're writing the next movement with one hand while you're conducting with the other. How much faster is the company growing than you thought it would be, and are there any steps you've taken to control this kind of fast growth?

How much faster? Well, our revenues this year will be ten times higher than our original business plan projected. So we basically stepped the plan up.

How do we control it? We watch the head count and the numbers. The first thing is prudent management: we watch the after-tax profit. We have a budgeting cycle in which each department manager is held to the head-count estimate in the manager's budget. We make exceptions if necessary. So we have in place people who are thinking about the corporate impact of what the particular group is doing. That's the basic control mechanism: a budgeting cycle in which forecasts are compared to actuals on a regular basis.

Are you a workaholic?

[Reflective] You know...I don't think so. When I'm not working, I don't think about work. I enjoy other things, like

long walks with my wife, reading trashy fiction [laughs] ...

Are there any common blunders which you see hardware and software vendors making.

Yes! Millions! [gentle laugh] Hardware vendors, for example, will say they'll make an IBM-compatible machine, and that they'll 'improve' it. Well ... it ceases to be PC-compatible in that case. When we explain to the vendor that adapting 1-2-3 for that really not fully compatible machine ... If more manufacturers who said they made compatible machines really had PC-compatible machines, then there would be a lot more machines that ran 1-2-3. So that's a classic mistake.

Another classic issue with hardware vendors is they still do not, in all cases, understand the value and necessity of software. They still have the 'iron mentality' - pumping a lot of iron, meaning hardware, through a distribution channel.

That's decreasing, and there is growing awareness and sensitivity on the part of the major manufacturers, but we still see a certain amount of insensitivity to the issue, which sometimes makes things laborious.

For example, IBM did so many things right when compared to all the other players who've been in the computer business that it's just astonishing. By going to open architecture, third-party software, retail distribution and so on, IBM pre-empted a lot of other vendors. Other vendors are still in a disadvantageous position - which they understand.

In the retail computer stores, there is still a gross lack of quality salespersonship. We devote a lot of resources to training dealers. We have a full-day, hands-on seminar on how to use and sell the product that's been attended by more than 600 dealer personnel. The experience of the average prospective customer walking into a computer store is still, despite our efforts, that product knowledge and awareness of users' problems and therefore of solutions is, on average, really lacking.

Some stores have very professional and knowledgeable salespeople, but the bulk of the retail stores are still uninformed. That creates a bad impression, makes our job more difficult and sort of slows everything down.

We also have to make the product easier to use and the hardware people have to build more power into the box to make the products easier to use. For example, Apple's Lisa computer, as a paradigm, not as a product, represents some steps forward.

Other software companies' big mistakes? Well, if I told them what they were doing wrong...! [good-natured laugh]

There's only one per cent magic to this stuff - it's all execution, all perspiration. You've got to have the classic strengths that make a business successful: product, marketing, management, and finance. And you have to be good in all those, attract the right management team, and be able to translate market needs into a product. I'm just quoting to you from my textbooks! I don't have any sophisticated philosophy. What people basically say about how to do things in business actually works.

You're saying it's a textbook, back-to-basics approach?

In many respects, yes. If there is any magic, it's in the creative part of the product design. The rest of it is all common sense, and a little bit of luck - being in the right place at the right time.

Business Or The Beach

What advice would you have for other software entrepreneurs?

Try to figure out what it is you really want out of the thing, personally. Do you want to run a business or to sit on a beach in Hawaii? If you don't want to run a business, get someone who does, and who you can work with and trust. Know what you want - there are too damn many opportunities! If you know what you want, you can act in some rational way to achieve it. Be serious. Educate yourself if you don't know what's going on, learn about it. Don't say you can't be bothered with that.

In the movie The Graduate, Benjamin is counselled to go into plastics. What would you advise for the 1980's - software?

Or robotics. Or biotech. Software is hot right now, but I try to restrain my enthusiasm and everyone else's. Hula hoops were here and gone. We have to create something of lasting substance and value. □

Les Bell reviewed the range of 'Perfect' software that comes with the Kaypro in our April 1983 issue. Steve Keen, who has been using the Kaypro/Perfect combination for several months, gives us a user's assessment of the package.



The Kaypro II, released in Australasia last October, follows the Osborne trail; both computers are portable, with integrated screen and disk drive and detachable keyboard.

KAYPRO II

The Kaypro II, which was released in Australia last October, follows the trail forged by the Osborne.

The most obvious similarities between the two computers are the physical. Both are portable, both have an integrated screen and disk drives, and a detachable keyboard. Comparisons are mixed, but the Kaypro wins out because of its full size 80 cm by 24 cm screen and excellent keyboard (however, the Kaypro's larger screen — 23 cm across the diagonal as opposed to 13 cm — is actually harder on the eyes).

Both machines stretch the definition of portable, weighing over 11.3 kg (25 lbs) each, and the Osborne's moulded plastic is probably a step ahead of the Kaypro's 'Sherman Tank' metal hide.

Though the physical aspects show the most obvious similarities, the main factor the two computers share is a design philosophy: both manufacturers expected most of their customers to buy off-the-shelf software rather than write their own programs. Both machines offered a suite of programs — for word processing and financial calculations — which were intended to satisfy the needs of the majority of users.

The computer professional knows that programs are the most important aspect

of a computer, but many novices are swayed by the physical. I was no exception. I wanted a portable to edit a book on Australia's rural sector, and went for the Kaypro because of its screen size. As a budding pro some eight months later, I thank fate that the programs supplied with the Kaypro are, speaking as a writer and researcher, the best supplied with any 8-bit computer.

Unfortunately, many reviews of the Kaypro have failed to give its software the accolades — or the criticisms — it deserves, because the reviewers are familiar with more established programs, such as Wordstar, and find the Kaypro's programs somewhat difficult to use.

That is not a problem for a first-time user, like myself. In fact, since the major programs supplied with the Kaypro are all products of one software firm and use the same key sequences for similar functions, the commands are actually quite easy to assimilate.

Virtual Memory

The main strength of the Perfect Writer word processor and Perfect Calc spreadsheet program is the ability to handle up to seven different documents at one time, and to display two of them on screen simultaneously. This is a function of 'virtual memory' architecture, where the

programs swap sections of files between the computer's RAM and the disk drive, and separate 'buffers' are assigned for each file in RAM.

The benefits to an author or researcher are enormous. Much research work involves writing summaries of several sources and then combining them in a paper. With Perfect Writer, you can have up to six references in the main memory, and swap between them as you assemble the final paper.

The benefits with Perfect Calc are even greater, because it is possible to 'associate' several files in the main memory. When doing spreadsheet work you frequently need to punch in raw data, then reduce it to some standard form, and finally perform calculations. This gets messy and cumbersome on one spreadsheet. With Perfect Calc, information can be entered in one table, converted by another and processed by a third.

For example, the book I am editing includes tables on corporate concentration, taken from ABS statistics which use nominal (unadjusted for inflation) prices. To be useful, the information has to be converted to real prices. Normally, I would need to work out a deflator in one table, then divide the nominal prices by the deflator for each of the 30 or so industry categories and 12 price entries per table. With Perfect Calc, I simply prepared one comprehensive table of price movements (and population growth) over 30 years, and then associated all my data files with it. The price movements table is loaded and real prices are calculated automatically when a concentration table is loaded.

The virtual memory feature combines well with the ability of all three programs to read each other's files. It is possible to compose Perfect Calc tables using Perfect Writer to 'print' a Perfect Calc table into a Perfect Writer document; and to transfer data entered into Perfect Filer to a Perfect Calc table for calculations.

These facilities will become standard for 16-bit computers as sophisticated memory chips are matched with sophisticated programs, rather than using beefed-up 8-bit workhorses. The Kaypro's Perfect programs give a taste of the future now, and will be even more powerful in 16-bit machines.



The Commands

Perfect Software's authors have gone for a combination of hierarchy and mnemonics in their command sequences. Both Calc and Writer are in insert mode when first loaded, and functions are accessed by using the CONTROL and ESCAPE keys and preceding a second command with CONTROL-X for eXtended commands. CONTROL commands are low level (for example, deleting a letter), ESCAPE sequences are high order (deleting a word) while eXtended commands are for file management. On the mnemonic front, D is for delete – CONTROL-D for a letter and ESCAPE-D for a word – C is for 'clear line', T for 'transfer' and so on.

In a *Your Computer* review of Perfect Software, Les Bell criticised the use of mnemonics for cursor control, with CONTROL-F for forward and so on, as opposed to the usual diamond layout used by Wordstar and the like. On the Kaypro, the cursor keys all function, so that isn't a problem (nor should it be on any computer where the keys can be re-defined). And though CONTROL-F is rather useless, ESCAPE-F and ESCAPE-B are not, particularly when you have to correct such things as transposed letters, or words that need capitalisation.

The strangest feature of the command set is also the most useful – CONTROL-Y for 'yankback'. Any deletion larger than a letter is stored in a temporary buffer and can be 'yanked back' with CONTROL-Y in any location. Copying and moving becomes a breeze, and it is possible to move through a document collecting information and add it all together at the end – a useful facility when you have written several chapters on different industries and then need a profile of one firm which straddles them all, for example.

An Automatic Book

The final blow for supremacy in Perfect Writer's arsenal is its ability to automatically set out a book, complete with chapter and section headings, footnotes, references and a table of contents. The words CHAPTER, SECTION, SUBSECTION and PARAGRAPH, when preceded by an @@ sign, cause the subsequent bracketed words to be treated as chapter, section, subsection and para-

graph headings. Each is numbered and set off from text (chapter headings are printed on a new page, centred and boldfaced) and an entry is made in a Table of Contents. If you insert a new section – or footnote, or reference – all are renumbered automatically. The days of innumerate authors being stymied by having to keep track of numbers are over.

The Other Programs

Perfect Filer and Perfect Speller round out the Perfect offering, with The Word (as a second spelling checker), Profitplan, Select, MBASIC and SBASIC completing the Kaypro cornucopia. Profitplan and Select are easy to use, but weak compared to the Perfect duo. MBASIC and SBASIC should be familiar to programmers, and it is a bonus to get both with the one computer. The Word's main advantage is that it can insert soft hyphens in Perfect Writer text.

Perfect Speller is designed to be used with Writer, and is extremely easy to wield. Its effectively 50,000-word dictionary checks a 5,000-word document in about two minutes, and displays any unknown words on screen. You mark which ones warrant checking, and then go into Writer (in Spell mode) to correct them in context.

Perfect Filer, the 'database' program, is perhaps the easiest of the Perfect programs to use, but the least satisfactory. While its word processing and spreadsheet stablesmates would rate as among the best in the business, Perfect Filer loses out badly in comparison with the industry standard, dBase II.

Rather than using control hierarchies and mnemonics, Perfect Filer presents you with a list of options which you select by typing an X. Designing a database is simple, as is making up subsets, lists and the like. The program's sort facilities are impressive – it can sort up to four variables at one time – and are far better than dBase II. For example, I have compiled a database of Australian aid organisations and their overseas projects. Information entered in no particular order is sorted first by region, then country, then type of project and finally by organisation, in the one operation.

But Perfect Filer is virtually innumer-

ate, accessing an entry to edit it is cumbersome, and it is impossible to update a particular field in all entries, as you can with dBase II.

The innumerate problem can be beaten to some extent by transferring information to Perfect Calc for calculations, using a 'list' that Perfect Calc can read (the trick is to have a serial number entry in every database). But this is far more cumbersome than simply saying 'replace price with sales tax*price', as you can with dBase II.

It is not possible to update a particular field in all entries, as you can with dBase II, and you can only edit by specifying the first four letters of the first field in the entry. This becomes a hassle when up to 50 entries may fit the criteria. For me, this problem could be overcome by having the subset section of the program interact with the edit section.

However, Perfect Filer is superb for simpler tasks such as maintaining a mailing list, generating form letters, keeping track of article abstracts, indexing a small library, and so on. I only hope that Perfect Software beefs it up to a full database program with later releases.

The Weak Points

There are several problems in Xanadu. Among the problems which qualify as bugs is ESCAPE-K, the command for deleting a sentence in Writer. It works by searching for a full stop followed by two spaces or returns. If it doesn't find them it 'freezes' the program and the only way out is via the reset button, at the cost of recently entered work.

The most annoying deficiency is the unnecessary limit placed on Perfect Writer's virtual memory, by the way it has been configured for the Kaypro. The package deal gives you a word processor which is capable of handling documents totalling up to 64K on screen, while Perfect Writer bought off-the-shelf can handle up to 248K. With the Kaypro's 191K disks, it would still be possible to have 160K worth of virtual memory, by reorganising the program modules. Though 64K may seem like a large document space for a 64K computer, it isn't large enough when, for example, you want to collect all the references to Elders IXL from several files, or move a

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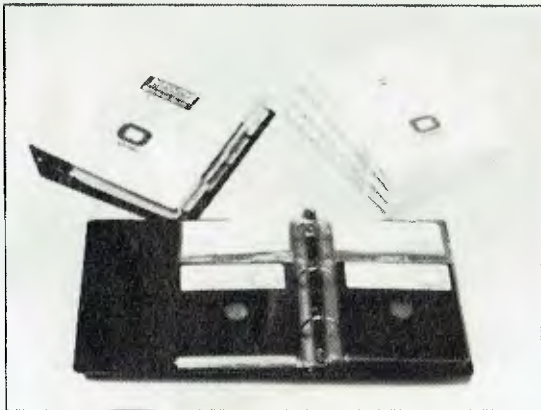
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large slab of text within a large file. Academic users strike the problem frequently, enough to tempt some to pirate the missing PWCONFIG program module.

The major problems with Perfect Writer are related to getting your finished product out of the Kaypro. Unlike Wordstar, which works on the 'what you see is (roughly) what you get' principle, Perfect Writer's formatting for printing is handled by an entirely separate program (Perfect Formatter) to its editor and yet another program handles printing (naturally enough, Perfect Printer). You can display the probable outcome on screen by making your normal printer the 'default device for console output', with the configuration program pfconfig, but you can't stop formatting to correct errors as you spot them. Since some of the errors involve tables being split between two pages, or section headings being typed at the bottom of the

page, the result is you have to go through the formatting procedure a number of times to polish your document.

It should have been simple enough to enable you to stop Formatter at a point, load Writer at the same point, edit and then return to Formatter. A similar function exists with Perfect Speller; after completing its scan it deposits you back in Writer to correct the mistakes.

There is a related hassle with the printing program, Perfect Printer. It is not possible to stop the printing - to correct the paper feed, for example - and restart it at the same point. You have to abort the printing, and restart (though you can recommence at the disturbed page). Nor can you print only part of a document - say from pages 20 to 35 of a 50-page document - as you can with Select. Though you can start from any page, the printing will scroll on to the end unless aborted.

Conclusion

The Kaypro hardware is good, but the software provided with it elevates it from the Holden to the Alfa class. Its Perfect Software complement provides a taste of what life *should* be like when 16-bit computers reach maturity, and any computer which doesn't have programs of comparable power simply isn't in the race.

But only Perfect Writer, Perfect Speller and Perfect Calc fully deserve their appellation. There are deficiencies with the support programs for printing, and the Perfect Filer database program, which mar an otherwise first class set. However, most of these flaws could be overcome fairly easily (Perfect Filer's lack of mathematics appears to be the only problem which would require substantial program development to lick), and I hope they will be dealt with in future revisions of Perfect Software. ☐

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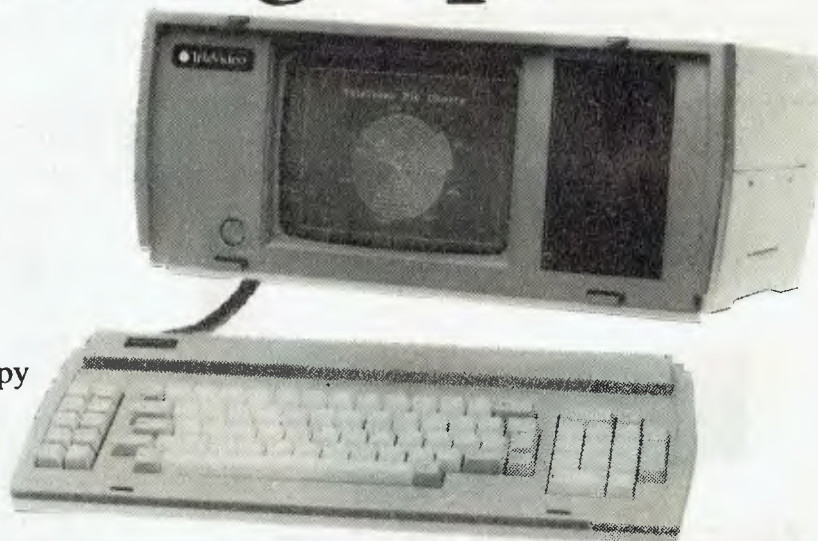
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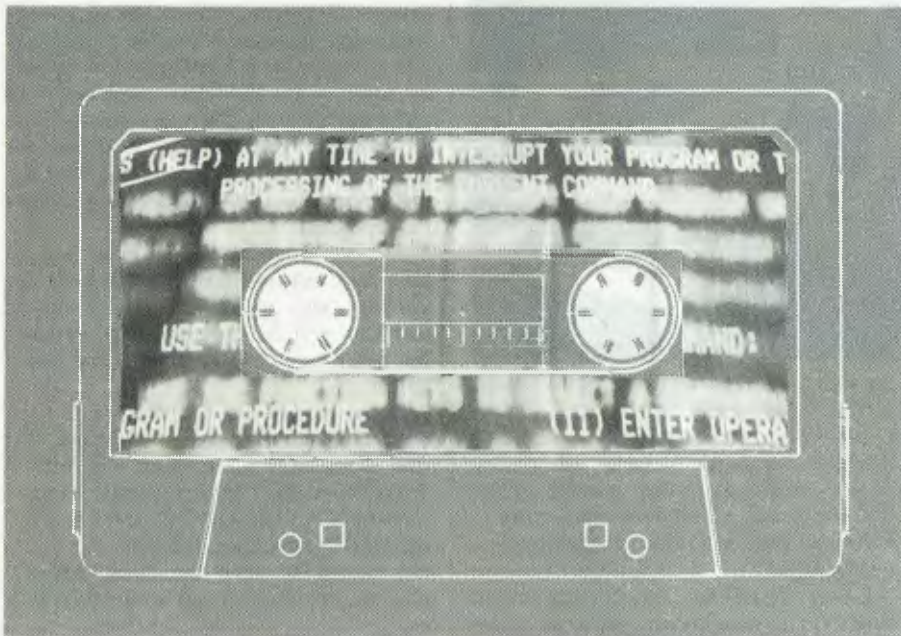
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Learning curves or 'The Hump' are always a difficult, often painful experience. So when someone comes up with a learning aid that takes away some of the hard slog it's worth sitting up and taking a look. Evan McHugh checked out a painless method of learning WordStar.

Learning Wordstar

By Cassette



WORDSTAR is a notoriously difficult word processor to learn, so I was pleasantly surprised when, after a couple of hours listening to a set of three cassettes and playing on my terminal, I had learned quite a few of the tricks of Wordstar I hadn't known about before.

The package is called 'How to Use Wordstar', published by Fliptrack Learning Systems and distributed by Imagineering. It contains the three cassettes and a user's guide containing a summary of the information provided in the cassettes. This is all boxed up in a handy book-sized package about the size of a 20 cm diskette box.

Learning by cassette is not a new idea, but 'How to Use Wordstar' is a package that will fill a great need for many

people. After, say, two hours you will have enough knowledge to create a file, save, edit and print — all covered in the first tape.

The second tape goes into some of the functions for improving the layout of documents and also for moving around chunks of code. The third tape goes 'in depth' on Wordstar for some of the more complex yet very useful functions related to file management, text layout and the global text editing commands.

Standard Or Non-Standard

I used this teaching aid designed for a standard Wordstar environment in one that has all kinds of non-standard arrangements (we editorial staff are randomly allotted drive C by our managing

editor and computer whiz, and the tape refers to drive A), but it still worked very well.

It has very few failings and most of these can be overcome by staying level-headed and remembering that at any time you can switch off the tape and have a stiff whisky. There are tones on the tape for this very purpose, occurring whenever some exercise you have to perform will take up a bit of time. Sometimes, however, you will find yourself turning the tape off and on continuously, so it is best if you have a tape player that has an easy-to-use off/on mechanism.

Another minor gripe is an example of the difficulty of transporting products from the United States without tailoring them for the Australian market. Most people probably won't find the dulcet tones of the instructor's American accent (soft and soothing, not harsh and twangy) hard to get on with, but for me someone who sounds like Ronald Raygun takes a couple of minutes to get used to. This is particularly the case when the techniques of word processing are described as "Your Friendly Wordstar Wizards". Shades of "your plastic pal who's fun to be with."

Fliptrack Feature

Such minor complaints aside, this package has many good things going for it. It is well organised, the steps are logical, and the pace is neither too rushed nor too slow.

There is also a 'Fliptrack' feature that allows you to turn the tape over and get more information on some of the topics covered. This is particularly useful when you run into problems with some of the exercises.

As a technique for learning Wordstar this set of cassettes is very useful. The use of a voice means the lessons are carefully paced, yet more personal than disk-based tutorials. As with all techniques where the student controls the pace of learning, it has the advantage of allowing the student to take his/her time, so students don't get flustered trying to keep up with the teacher and teachers don't chew their fingernails off with impatience. It is also good as a quick and painless course for more experienced Wordstar users to pick up some tricks they may not have known before. ☐

Not only does the HP-150 use the MS-DOS operating system, it has an 8088 processor operating at eight MHz, which is significantly faster than most PCs on the market.

Ease of use is the name of the game, writes Les Bell.



There's no doubt about it, Hewlett-Packard have a point when they say the most natural pointing device is the finger. They call their new baby the 'mouse killer', and there's something in that. Perhaps mouse-trap rolls off the tongue slightly better, but it isn't quite as positive.

The HP-150 has two major claims to fame – its incredibly small size, and its touch-sensitive screen. Let's dispose of the size first: the 150 has a footprint measuring less than a foot (304.8 mm) on each side, and it's not much taller even when sitting on top of its twin 7.6 cm disk drive unit. The result is that the computer does not dominate the user's desk, a worthwhile objective.

Despite the small package, the 150 manages to cram a lot in: the basic unit has 256K of memory (expandable to 640K), two serial I/O ports, an HP-IB interface, a screen, and there's still room to spare for an optional printer! But most important, the screen is touch-sensitive: the user can make things happen simply by pointing to areas on the screen.

To add to the unit's appeal, it uses the MS-DOS operating system. In the end, it may be this that is the major factor in

the unit's success, with the touch screen merely being icing on the cake. In the past, HP have generally marketed machines with their own proprietary processors and operating systems, while the market has generally sought safety in numbers, preferring the standard operating systems.

However, HP has always been able to count on strong loyalty from its users. Whatever the company does, it does well. Owners of HP pocket calculators, for example, are always loath to switch allegiance to other brands, even with vast price differences. The HP 80 series of computers has therefore sold moderately well in scientific and technical areas, where the HP name and quality were well known.

The 150 should change all that. Not only does it use the MS-DOS operating system, it has an 8088 processor operating at eight MHz, which is significantly faster than most PCs on the market.

But back to the unit itself. The front of the unit is mostly taken up by the 23 cm screen which is a very high quality green phosphor type. The screen resolution is 512 x 390 for the graphics plane, and 720 x 378 for the alphanumeric display plane. Both can be displayed at the

same time, and this is how many of the touch screen graphics work.

The alphanumeric display plane provides an 80 x 27 display, rather than the more common 80 x 24. This allows it to display the time and various other keyboard indicators (such as numeric lock), as well as the inverse video boxes which represent the user definable keys – 'softkeys' – on the top edge of the keyboard.

The keyboard itself is larger than the earlier HP 120 model. In fact, it is considerably larger than the other space-saving design qualities of the 150 would lead one to expect. It is a sculpted low-profile keyboard with 107 keys organised into a QWERTY area. There are cursor keys, a numeric pad which doubles for graphics control and miscellaneous editing keys, plus the eight softkeys across the top edge.

The keyboard has a nice feel, is logically laid out and has enough keys for virtually any application. It's expected that this will be the standard keyboard for other new HP terminals and computers.

At the rear of the machine are its various connectors, for the keyboard, the two RS-232C ports, and the HP-IB (Hewlett-Packard Interface Bus) connector which leads to the disk drive and any other HP peripherals. There's also a battery recess (to keep the clock ticking), plus the power inlet and a switched outlet.

At the rear of the unit at its base are a couple of blanks behind which are expansion slots for more memory.

The computer sits on top of its dual disk drive unit. Each 9 cm microfloppy provides 270K of storage; if more storage is required, both 13 cm floppies and 20 cm floppies are available, but more likely, the user will opt for a Winchester disk. The performance of the microfloppies was quite respectable; something that is important where they are the prime form of mass storage.

Internally, the system is based on an Intel 8088 microprocessor running at 8 MHz, which should satisfy most speed merchants. The basic model has 256K of memory, which is adequate for most applications, and it can be upgraded to 640K for those who are building large financial models and spreadsheets.



A touch-sensitive screen makes applications programs easy to learn and use.

Software

The operating system, as mentioned above, is MS-DOS. Of course, since it has only 9 cm disks, the 150 does not meet standards for MS-DOS portability of software, but Hewlett-Packard will no doubt supply a goodly selection of software in the appropriate format. If the machine is as successful as they hope, other third-party software distributors will start to support the machine.

The standard software supplied with the machine is the Personal Applications Manager, which forms a 'shell' around the operating system, and Microsoft BASIC – interestingly enough in a relatively unenhanced form, and not the more popular GW-BASIC.

PAM insulates the user from the chill winds of MS-DOS. It is a similar system to some of the menu managers that have been around for CP/M, only it is considerably more elegant. When a disk is first inserted, it scans the disk for applications software – executable files – and displays a list of applications in reverse video blocks on the screen. The user can simply point to one of these to select it, and then to a softkey area at the bottom edge of the screen to load and run it. These are touch-sensitive inverse video labels that correspond to the softkeys on the keyboard.

When an applications program prompts for a filename, it is generally possible to escape to the file management system in PAM, to display the files on the disk. Once a file has been selected, another softkey returns that name to the calling program.

The HP-150 will have a good selection of software available right from the release date. For example, both WordStar and VisiCalc have been customised for the 150, and other applications are on the way including dBase and Condor Series 20.

VisiCalc is significantly different on the 150, compared with other versions. First, it is more advanced than earlier versions in some respects. But most important, the human interface has made the program even easier to use.

To move the cursor to a call simply point to it. It's that simple. Most commands are now on softkeys and can be accessed simply by pointing to them. Multi-

ple windows are available.

WordStar has also been extensively modified to operate with the touch screen, though with less success than VisiCalc. It is possible to move the cursor around the screen with a fingertip, and most of the command prefixes have been placed on the 'softkeys'.

However, because of the way the touch screen works, it is still possible for those familiar with the 'old' WordStar to use it without being frustrated. The major benefit of this version is ease of use – it does not require the massive help screens.

More successful and dramatic than either of these programs, however, are two programs specially written for the 150, called MemoMaker and Personal Card File. MemoMaker is a simple word processor for those to whom ease of use is paramount. While it is compatible with WordStar, it is not as complex. It is intended to handle simple memos, reports and letters and is capable of 90 per cent of the jobs that WordStar would previously be used for.

Easily the best demonstration of the touch screen, however, is provided by Personal Card File. In this simple list file manager, the file is displayed in the form of a Rolodex, with the key field – usually the first – displayed on the tabs of the file cards. Touching one of the 'wheels' at the side of the Rolodex causes it to revolve and display more cards, while touching one of the tabs 'withdraws' the card and displays it on the screen.

The card can now be edited: just touch a field to select it and use the edit commands on the softkeys. To locate cards, fill in a blank form with the fields to match and the screen will display a subset of the original Rolodex.

Virtually all the software for the 150 has been modified to allow data to be transferred between packages. That is, VisiCalc data can be transferred to WordStar, to MemoMaker for use in a memo, or to a graphics program for plotting. Condor or Personal Card File databases can be passed to MailMerge for WordStar circular letters.

Because the 150 uses conventional MS-DOS, other programs can be run without taking advantage of the touch screen. Programs such as dBase II and Condor can be run.

The touch screen is actually an output device as far as programming is concerned. Touch-sensitive areas are defined by sending an escape sequence to the screen. This defines the location, size, and other attributes of the panel, including normal/inverse video, triggered by finger moving in/out and other details.

When a finger triggers the area, the touch screen software sends a user-defined string to the system. The system thinks the string came from the keyboard – which is how WordStar retains its old commands. The touch screen can be simply driven from BASIC, or indeed any language that can generate the appropriate escape sequences and accept keyboard input.

Installation of peripheral devices such as printers and plotters is exceptionally easy. The 150 comes with an installation menu – touch-driven, of course – which lists all the likely HP peripherals, plus generic types. For example, installing an HP plotter is as simple as selecting it off a menu. Once installed, the input/output code in MS-DOS is patched, so it wakes up expecting that device to be attached. If it isn't, incidentally, the system does not hang like most, it performs some kind of intelligent action.

The graphics display on the 150 is well up to HP's high standards, and we can expect a wide selection of business and engineering graphics software from the machine. It is particularly fast at graphics, owing to a custom gate array design for the graphics controller.

Graphics can be printed on the optional built-in thermal printer. This installs at the top rear of the case, and the 150's power supply is beefy enough to cope with it. While the internal printer will be adequate for many applications, many users will prefer an external printer; possibly an impact or letter-quality type, so the options are left open.

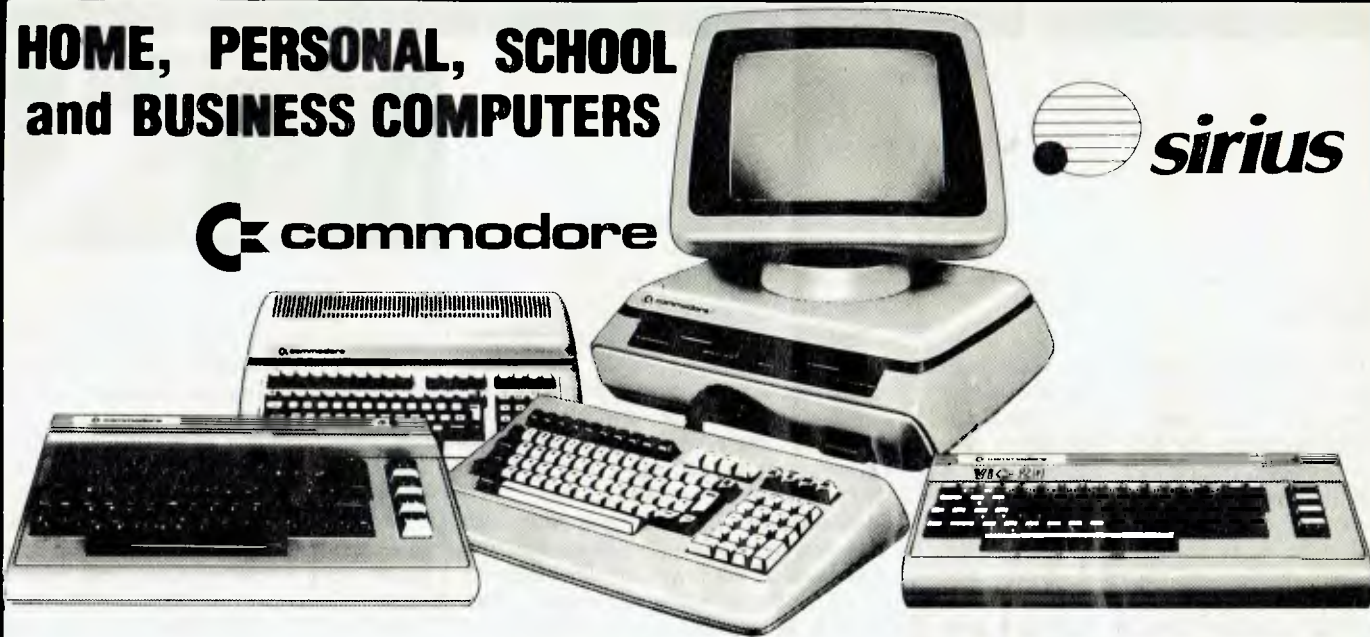
In summary, the 150 is a very nice machine indeed. It has no obvious failings, and is well thought out and designed. I played with one for the best part of a morning and was impressed at how easy it was to use.

This is the strongest attempt yet by HP to break out of the 'scientific/technical computing' mould. It looks like being a great success. □

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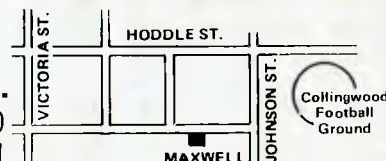
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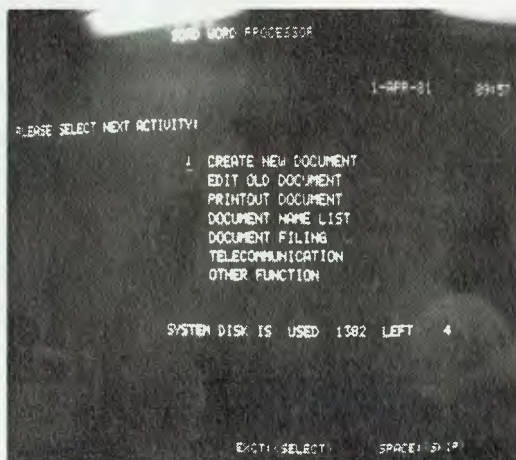
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Wang dedicated word processing systems are well known. Sord recently adopted the same style of word processor for its computers, and Softword Systems Inc (USA) has brought out a WP package for the IBM-PC called MultiMate, which unashamedly copies the Wang style.

WANG

Wang-Style Word Processing on the ...

SORD & IBM-PC



By Dom Swinkels

As I mentioned in the September 1983 issue of *Your Computer*, the manual for the Sord M23 word processor is excellent, and the MultiMate manual is typical of the IBM type and quality of manuals. Although there are some minor differences between these three word processors, one is struck by their similarities, and I feel sure that anyone who is competent in one of these can use the others without much trouble.

Wang Style

So what is the Wang style of word processor? It is a page-oriented rather than a file-oriented system. This means that to a typist it feels somewhat like ordinary typing, since a document consists of a series of pages and you must call up the page required to work on it.

This means that only one page is in memory at a time, and the document length is only limited by the amount of disk space available. It also means pagination is done as you go rather than at print time, but it does make it more difficult to rearrange text significantly.

However, once you have made a first draft it is very easy to move about in the document because you can call up any page of its text.

The second main feature of this style of word processor is that you see what you get at all times. Text is formatted on the screen in the same way as it will be printed. This, together with the page format, means you never get lines wrapping around unexpectedly at printing time, or find that a heading appears on one page and the text starts on the next.

It also means there is no need for embedded control characters to vary indentation or spacing. It is all done as you type the text in. This is not to say that it cannot be changed later. All text input is done after a format line, which sets the length of the line and its tab positions. You can insert a new format line in the text at any point, and you can go back and change it at a later stage. All subsequent text will then conform to the new format line. What is more, standard format lines can be stored and recalled when needed, so it is not necessary to remember a format to be used regularly.

There are obviously advantages and

disadvantages associated with this style of word processor. It is very much a typist's word processor because of its similarities to the normal tasks performed when typing a document using an ordinary typewriter. Someone approaching it from the background of a computer programmer would probably prefer the file-oriented style of word processor, in which all text is just typed in as one long string, and any formatting for appearance is done after a draft print-out by simply changing commands for indentation, margins and so on.

Sord M23 Version

There are two special keys on the M23 keyboard, which are probably only used by the word processor. They are the EXECUTE and CANCEL keys. They are marked with an E and a C and are located at the bottom right-hand corner of the numeric keypad.

All other keys in the numeric keypad have been re-defined by the word processing program, as have the seven function keys. As we will see later, most of the word processing functions are selected by one of these keys, and they correspond to many of the keys on the keyboard of the Wang dedicated word processor. The EXECUTE and CANCEL keys are used all the time, to execute commands or to cancel them.

Getting Started

To get started with the Sord word processor, it is only necessary to boot the word processor disk and follow the directions. First you are asked the time (the system has already asked for the date before any disk is booted), and then a seven-choice menu appears. At this point all keys are disabled except the up and down arrows, the space bar and the EXECUTE key. The space bar is used to move a pointer down the menu, while the EXECUTE key selects the menu option pointed to at that time. The menu items are:

- Create New Document
- Edit Old Document
- Print Out Document
- Document Name List
- Document Filing
- Telecommunication
- Other Functions



Except for 'Other Functions', it is fairly obvious what each choice will do. The system of selecting an option by moving a small arrow on the screen using the space bar and pressing the EXECUTE key is used with all menus, and the user is reminded of this with a prompt line at the bottom of the screen.

If we choose the Document Name List option above, then a new menu appears with two sets of choices. We must choose which disk we want the name list for (System disk in Drive 0 or Archive disk in Drive 1), and where we want the list to go to (screen or printer). In this case the RETURN key is used to jump from the first set of choices to the second one, again indicated by a prompt line at the bottom of the screen.

However, a small inconsistency occurs here; it does not work if you hit RETURN again to go from the second group back to the first group of choices. Instead, the choices are executed as they stand.

At any time you can also hit the CANCEL key to cancel the current operation and return to the previous state of the system (for example, going back to the main menu from a sub-menu).

Creating A New Document

Creating a document is done by answering some questions (document ID, lines per page and number of pages) and filling in a form on the screen (name, operator and author). At this stage it becomes clear yet again that the word processor is meant to be used by a typist (the operator) as opposed to an actual author. The same summary page comes up whenever the document is edited later, showing when the document was created and when it was last revised or printed. It also shows the number of pages actually used and the number of keystrokes made, as well as the time taken by the operator.

You leave the summary page by pressing EXECUTE, and the first 'page' appears on the screen. The screen, however, is not blank. It shows the document ID, page 1, line 0, position 3. This information is always displayed at the top of the screen, so there is never any doubt about where you are in the document.

The cursor is located at the start of the format line, which is the second line on the screen. It shows the length of the format line by a string of dots, and the position of the tabs by vertical lines. You may accept the current format line or create a new one to suit the needs of the document to be typed. To accept the line you press EXECUTE, and to change it you simply run along it by pressing the space bar for every dot required and the tab key for setting a tab. You can backspace using the left arrow if you change your mind about a tab position.

However, be careful not to backspace all the way to position 1 on the line, because at that point the system seems to lock up and you can only accept the current format line by pressing EXECUTE – but all is not lost. If at any time after you have typed your document you wish to change the format line, simply press 9 on the keypad, which is now the GOTO FORMAT LINE command, and you are again at the start of the current format line. Make any changes you wish, press EXECUTE, and the new format is in effect. The current screen is immediately reformatted below the new format line.

Entering text is done by typing in the normal manner. Lines wrap around, and if the current word runs into the end of the line the whole word is sent to the next line. When you reach the end of the page length set at the start of the document, a buzzer sounds at the end of each line, to remind you it is time to consider starting a new page; simply press F2, which inserts an End Of Page mark.

Text Editing

To edit text, move the cursor to the location on the screen where the editing is to start. You can of course only edit the page currently in memory, and since the screen can only display about 20 lines, a single page is normally broken up into three or four screens. You move between screens by using the NEXT SCREEN and PREVIOUS SCREEN keys, and to help you keep track of the text the last three lines of any screen are repeated at the top of the next screen.

You can then type over text, delete text, search and replace, move a block of text (MOVE deletes the text in the old

position), or COPY text and retain it in the old position.

The definition of the text to be copied, deleted or moved is very convenient. You locate the cursor at the start of the text to be defined and press the relevant action key – for example, DELETE. The question "Delete what?" appears in the top right-hand corner of the screen, and you now press the key of the last character of the block to be deleted. The text from the starting position to the first occurrence of the character entered is shown in inverse video. If that character occurred prior to the end of the block required, you simply press the key again. If you make a mistake you can press a different character or work back using the back arrow. At any time the whole operation can be aborted by pressing CANCEL. Only when the correct block to be deleted is highlighted in inverse do you press EXECUTE and presto, it's done.

In the case of a COPY or MOVE command the question becomes "To where?". You then move the cursor to the desired location and press EXECUTE again to complete the operation. To COPY or MOVE material to another page, the "To where" request is answered by "GO TO PAGE x", followed by positioning the cursor at the desired location on that page and pressing EXECUTE.

Other Functions

There are many other functions and facilities available. You can CENTRE text and simply type it in; the text remains centred as you add or remove characters. Often-used lines can be saved in a glossary and recalled at a single keystroke.

Any text file on disk can be converted to a word processor file and vice versa, and the WP system can make use of all the set-up capabilities of the M23. This means when using a colour monitor the text can appear in any colour on any background available on the M23. Auto repeat rate and delay can be varied. Buzzers can be turned on or off, and the communication modes for the serial ports can be set as required.

All normal disk operations are available under Document Filing. To copy files from one disk to another, make

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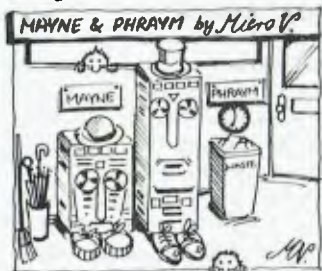
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MAYNE: I was at it in a loop.

Contact:
MICHAEL LA ROBINA,
472 ANZAC PDE.,
KINGSFORD, NSW 2032.
(02) 662-4063.

Multimate was originally written for the Connecticut Mutual Life Insurance Company which had an established group of dedicated Wang word processors and wanted the same capabilities from its newly-installed IBM-PCs.

Fig. 1

DOCUMENT SUMMARY SCREEN

Document TEST 1
Author DAJS
Addressee Your Computer
Operator ds

Identification key words :
WANG
wordprocessing
review

Comments :
A review of WANG style word processors (SORD and IBM)

Creation Date 09/19/83
Modification Date 09/19/83

Use tab keys to change fields - Press F10 when finished

Fig. 2

Submit a Document for Printing

Drive : A

Document: review-s

Current Time is: 12:29:24
Current Date is: 09/19/1983

Delay Print until Time is: 12:29:24
Delay Print until Date is: 09/19/1983

Print Document Statistics? N
Print Spooling Statistics? N
Delete Spooler Entry when done? Y
Print in Background or Foreground (B or F)? B

Left Margin	000	Pause between Pages?	N
Start Print at Page Number	001	Right Justification?	N
Stop Print at Page Number	999	Draft Print	Y
Header/Footer First Page Number	001	Default Pitch	4
Printer Number	001	Printer Type	EPSON
Number of Original Copies	001		
Document Page Length	070		

Printer types available:
EPSON TTYCRLF PRISM BROTHRI CENTR353 CITHDF10 DIABL620 DIABL630
IBM NEC3550 NEC7730 NEC5510 NEC3515 NEC3510 SMITHCOR DKDATAB2

back-up copies of the whole disk and delete files when no longer required.

MultiMate Version For The IBM-PC

The MultiMate package provides the same Wang-style WP capabilities for the IBM-PC. It is quite large and requires a PC with 192K of RAM memory. Its size is due to the fact that extensive HELP files are available in memory; the speed advantages of this are worth the extra memory required.

The references in the manual all refer to the standard IBM-PC keyboard, and see-through, colour-coded, adhesive labels are provided for quick and easy identification of the function keys, which are used to provide many of the standard WP functions. However, many HELP screens and a function location chart are also provided for use with an unmarked keyboard.

Getting started with this package requires that you create a working system disk first, since no disk operating system is provided. This ensures that your WP system will always be compatible with the rest of your IBM-PC disks.

To create the WP system disk you must FORMAT/S a disk, using your existing DOS master disk. This creates a formatted disk with the same version of DOS on it as the master disk used to create it. The WP files are then copied from the single-density disks supplied with MultiMate to the newly formatted disk(s) using COPY *.*. Your working copy can be a single double-density disk, a hard disk or several single-density disks.

Origin Of MultiMate

The MultiMate program, which was formerly known as WordMate, was written



by W.H. Jones & Associates Inc for the Connecticut Mutual Life Insurance Company. This Company had an established group of dedicated Wang word processors, and was also putting in IBM-PCs. Rather than asking staff to learn a new word processing system, they decided to commission a similar package for the PC, and MultiMate is the result. The similarities are therefore immediately obvious and start with the main menu:

1. Edit Old Document
2. Create New Document
3. Print Document Utilities
4. Print Control Utilities
5. Merge Print Utilities
6. Document Handling Utility
7. Other Utilities
9. Return to DOS

There is no Option 8. This may be reserved for a future upgrade such as a communication facility.

After selecting the main menu option from the above list, the user is presented with an appropriate form to fill in or select further options from. Figures 1 and 2 show typical examples of these, and the richness of options available becomes clear.

Figure 1 shows the Document Summary Screen associated with every document. Documents can subsequently be retrieved on any of the fields.

Figure 2 shows the Document Printing Screen and indicates the range of printers supported, and the spooling and background printing capabilities.

Figures 1 and 2 also show the only problem I found with the package, which is that it only allows the American style of date - mm/dd/yy.

The program is self-documenting to a large extent and has a lot of help screens available in memory at all times.

Table 1 shows the many functions available using the function keys, while the standard IBM keyboard cursor keys and INSERT and DELETE keys perform the expected functions. To abort an operation such as COPY, MOVE, INSERT or DELETE part way through, you hit the ESC key and are returned to where you were before you started one of these editing functions.

Table 2 shows the main command HELP file and the keys to be pressed to go to the next HELP level. These keys

F-Key Only	SHIFT + F-Key	CTRL + F-Key	ALT + F-Key
F1 Go To	Help	Go Place Mark	Set Place Mark
F2 Page Break	Page Combine	Repaginate	Page Length
F3 Centre	Column Mode	Horizontal Add	Scroll Left
F4 Indent	Decimal Tab	Vertical Add	Scroll Right
F5 Library	Library Attach		Word High Light
F6 Search	Replace		Line High Light
F7 Move	Hyphen		Sentence HiLite
F8 Copy	External Copy		Paragraph HiLite
F9 Format Change	Format Current	Format System	
F10 Save/Exit	Save	Format Page	

Table 1 Uses for the MultiMate Function Key.

FUNCTION	KEY(S)	FUNCTION	KEY(S)	FUNCTION	KEY(S)
AUTO PAGE NUMBER...	Shf 3	AUTO UNDERLINE...	Alt -	BACK TAB.....	Shf Tab
CENTER.....	F3	CHAR DELETE.....	- kypd	CHAR INSERT.....	+ kypd
COLUMN MODE.....	Shf F3	COPY.....	F8	CREATE DOCUMENT...	Alt 2
CURSOR DOWN.....	↓	CURSOR LEFT.....	<-	CURSOR RIGHT.....	>
CURSOR UP.....	↑	DECIMAL TAB.....	Shf F4	DELETE.....	Del
DOC HANDLING UTIL...	Alt 6	DRAFT PRINT.....	Alt D	EDIT OLD DOC.....	Alt 1
END.....	End	END OF PAGE.....	Ctl End	ENHANCED PRINT...	Alt N
ESCAPE.....	Esc	EXTERNAL COPY.....	Shf F8	FOOTER.....	Alt F
FORMAT CHANGE.....	F9	FORMAT CURRENT...	Shf F9	FORMAT DELETE....	D
FORMAT LINE.....	F	FORMAT PAGE.....	Alt F9	FORMAT SYSTEM....	Ctl F9
GOTO.....	F1	GOTO PLACE MARK...	Ctl F1	HARD SPACE.....	Alt S
HEADER.....	Alt H	HELP.....	Shf F1	HIGHLIGHTING.....	H
HOME.....	Home	HORIZONTAL ADD....	Ctl F3	HYPHEN (soft)....	Shf F7
INDENT.....	F4	INSERT.....	Ins	LIBRARY.....	F5
LIBRARY ATTCH.....	Shf F5	LIBRARY DOC.....	L	LINE HIGHLIGHTING...	Alt F6
MERGE CODE.....	Alt M	MERGE PRINT UTIL...	Alt 5	MOVE.....	F7
NEXT PAGE.....	Ctl PgDn	NEXT WORD.....	Ctl ->	OTHER UTILITIES...	Alt 7
PAGE BREAK.....	F2	PAGE COMBINE.....	Shf F2	PAGE DOWN.....	PgDn
PAGE LENGTH.....	Alt F2	PAGE UP.....	PgUp	PARAGRAPH HILITE...	Alt F8
PREVIOUS PAGE....	Ctl PgUp	PREVIOUS WORD....	Ctl <	PRINT CUR DOC UTL...	Alt 3
PRINT CTRL UTIL...	Alt 4	PRINT CTRL CODE...	Alt A	PRINT PITCH.....	Alt C
REPAGINATION.....	Ctl F2	REPLACE.....	Shf F6	RORD PAGE BREAK...	Alt B
RETURN.....	R	RETURN TO DOS.....	Alt 9	SAVE.....	Shf F10
SAVE/EXIT.....	F10	SCROLL LEFT.....	Alt F3	SCROLL RIGHT.....	Alt F4
SEARCH.....	F6	SENTENCE HILITE...	Alt F7	SET PLACE MARK....	Alt F1
STOP PRINT.....	Alt P	STRIKE OVER.....	S	SUBSCRIPT.....	Alt W
SUPERSCRIPT.....	Alt 0	TAB.....	Tab	TOP OF PAGE.....	Ctl Home
UNDERLINE.....	Shf -	VERTICAL ADD.....	Ctl F4	WORD HIGHLIGHTING...	Alt F5

Table 2 A list of all functions and the key(s) to press for help.

are generally the same as those pressed to use the function during the editing or formatting of the text.

Some very useful functions (particularly for an insurance company) not normally found in WPs are the table manipulation functions. Tables can be typed in using tabs to line up the columns. The decimal tab function ensures that the table format maintains the decimal point position lined up automatically. The vertical and horizontal addition functions allow simple summations to be done, while column add, move and delete functions make table editing easy.

It is not possible to discuss all the op-

tions available in this short review; a more detailed review may be found in the February 1983 issue of *PC Magazine*.

ACI in Sydney has indicated to me that it will shortly be marketing MultiMate for the IBM-PC in Australia, and my local Newcastle dealers, Sheather and Merrigan, are retailing it for the AWA Corona computer for \$595 (MultiMate was written for MS-DOS, so needs only minor modifications to be used on any machine with a similar DOS). My copy came from SoftWord Systems, 52 Oakland Avenue North, East Hartford, CT 06108, USA. The recommended price there is \$US495.

GBS is a database management package which runs on various micros. David Hill purchased a copy for his Kaypro II and wrote down his impressions of the software for 'Your Computer'.

GBS DATABASE MANAGEMENT

on the Kaypro II

The GBS (General Business System) database management program for microcomputers is a suite of four programs. These are marketed as a set of six disks, one for each program plus two with demonstration programs. A large, loose-leaf, ring bound and attractively typeset manual completes the package.

My copy was purchased and installed in a Kaypro II, and all comments herein refer to GBS on the Kaypro. When used, one module booted up with a different serial number to the others and one failed to run at all. President Computers in Melbourne hand-delivered a replacement copy the same day. (Thank you Steve.)

The four programs are:

1. GBS - the database manager itself. The manual suggests that this program is available without the other three generator programs. GBS is presented as a programmable, relational database manager.
2. QUICK GEN - a rapid program generator which writes programs to run under GBS.
3. REPORT GEN - a versatile program which creates reports to your specifications and based on information extracted from GBS data files.
4. MENU GEN - creates menu programs that can supervise a group of other programs created by Menu Gen or Report Gen (as well as those written directly in GBS's own tabular code).

Just a Simple Database

After some reading of the manual and a practice run or two with the demonstration programs, I attempted to establish a simple database. For this test I de-

cided on six alphanumeric fields for name and address information; a membership-due-date field; and an integer membership number field. An ability to accept dates in the Australian ddmmyy format and to sort on those dates was also required.

The inbuilt DATE function is designed to accept and display dates in the American mmddyy format. There being no obvious means suggested in the manual to change the date routine, I decided to take advantage of the 'programmable' facilities and create my own. The idea was to input day, month and year as separate fields and from these manufacture a sort number to be stored with the names and other data in the file.

Having made these decisions, Menu Gen was loaded and run. It took exactly 26 minutes to formulate a data input screen, define 11 separate fields and save to disk the first batch of test records. This included establishing the routines to convert the date inputs into a single field on which the program could sort.

Absolutely Marvelous!

Report Gen took only a little longer to put reports in membership order, sort them into subgroups of membership-due-dates and tumble them off the printer.

So far so good. I could achieve all that with my level of BASIC or Pascal at the cost of a couple of weeks part-time work.

But then the problems started to appear - far too many problems for a product in this price range.

The manual does not mention the inbuilt data corruption factor. This amazing option works as follows. Consider a field defined as an integer with a length

of four characters. Under GBS this would allow an integer input with a maximum length of three characters and room for a trailing sign. When prompting for an input, GBS will position the cursor at the beginning of the field and a '0' at the end. If you type either '1' or '123' and then TAB, (GBS programs expect data entry to be terminated with TAB, not RETURN) GBS will store '1' or '123' as expected. However, if you type '12' followed by TAB, GBS will store the value 120.

To avoid this unexpected raising of your input by a factor of ten, it is necessary to ensure that an input never finishes with the cursor resting in the screen position immediately prior to the '0' mentioned above. It must be moved past this position with the space bar - most confusing, quite unnecessary and potentially disastrous.

When entering characters in an alphanumeric field, the cursor automatically jumps to the beginning of the next field once the defined length of the first field is full. However, for numeric fields this is not the case because the program will wait for a TAB - an annoying inconsistency.

When in the command mode it is possible to exchange the operations of the TAB and the RETURN keys, thus conforming to the more usual data entry pattern. However, for turnkey operations that run Menu-Gen-generated programs this option is not available.

Intimidating Tables

GBS is claimed to be a programmable database management system. A quick glance through the manual shows sample listings of GBS programs. These programs are written as entries in three tables, the Procedure table, the Select Table and the Calculate Table. For anyone whose programming background is in BASIC or Pascal, these columns of numbers are more than a little intimidating.

I believe that any reasonable person looking at a listing such as that shown in Figure 1 would conclude that there is ample opportunity within the program structure to include adequate and clear documentation while the code is being written. Unfortunately, this is not the case. The seemingly self-documented listings, as shown in the manual, cannot be produced by any of the included generator programs, nor by GBS itself.

Misleading Packaging?

In my opinion, the manner in which the listings are presented in the manual constitutes less than completely honest packaging.

While Menu Gen will rapidly generate programs to collect, store and manipu-

late data, it is impossible to establish upper and lower acceptable limits for any input. All data verification routines must be written in GBS tabular code – a process I'm sure many will find too tedious to master.

Consider the following short BASIC routine:

```
FOR X = 1 TO 5 PRINT
"YOUR COMPUTER IS A
MONTHLY MAGAZINE" NEXT X
```

Such a routine in GBS would require an entry in the procedure table of:

01 J 00	T	01 007
02 L 10	YOUR COMPU	03 010
03 L 10	TER IS A M	03 020
04 L 08	AGAZINE.	03 030
05 C 01		00 000
06 J 00		00 001
07 C 02		00 000
08 J 00		00 000

Plus an entry in the Select Table of:

```
01 A99 ) 5
```

Plus a Calculate Table entry of:

```
01 A99 + 1 A99
02 0 T A99
```

Looking at the listing above, you can see the Procedure table controls the program flow. The first instruction causes the program to jump to the eighth instruction, if the condition in the Select table entry 01 is true. The first condition in the Select table is accumulator A99 is greater than or equal to five. Accumulator A99 stores the video row number.

Procedure steps 2-5 use the List instruction to display blocks of ten characters at defined positions on the screen. Step 6 performs the first calculation listed in the calculation table and thus increments the line counter. Step 7 closes the loop and sends control back to the first line where it is tested. If it is found to be greater than or equal to five, control is jumped to the eighth instruction. Step 8 references the second entry in the calculate table and thus clears the A99 accumulator. Step 9 returns control to the COMMAND level of GBS.

It's A Struggle

There have to be some tremendous advantages before the average person is going to struggle through that ritual rather than the two lines of code required in most other high level languages.

GBS seems to provide a versatile programming language for anyone with the time and patience to struggle with its tables. Several factors conspire to make programming unnecessarily difficult, and listings very confusing to read without supplementary notes. As program flow jumps back and forth from one table to another, a programmer needs to be able to keep at least three separate table listings in view at the same time. It is impossible to attach meaningful names to variables stored in the Accumulators or

in the Select table. The insertion of REM or COMMENT notation within the code is virtually impossible. Anyone looking for Pascal-type paragraphing is going to be disappointed.

The 16 instructions available to the procedure table do, however, provide a great potential for the dedicated GBS user to tailor programs to meet his own specific requirements. If one were to believe the promises in the advertising and the manual, that amount of dedication should not be necessary.

In the COMMAND (or programing) mode there is a command, IP, which inserts blank lines into the procedure table and rennumbers all lines following. In my hands GBS accepts the IP command and prompts for the number of lines to insert. Unfortunately, it then ignores the operator's request and inserts only one line.

For many applications it is convenient to send information contained in a variable or field direct to the printer. With GBS programs that is impossible. It is possible to format on the screen exactly what is to be printed and then instruct the program to print the screen image. This is clumsy, slow, and makes the screen distractingly busy, but it does work.

Formatted fields can be sent to the printer via Report Gen modules. This entails two disk accesses while the Report Gen module is loaded and executed, before the main module is reloaded and the program continues.

In Summary

GBS is, within the confines of the programs produced by the generator modules, an extremely easy and fast method

"If the purchaser really desires to utilise the 'programmable' facilities, he could well find that it is just not worth the effort involved."

of setting up a database on microcomputers. Programs can be scheduled to act in concert with one another, each being called from a master menu and capable of 'relating' data in one file to that in another, as well as being able to pass information stored in one field from one database file to another. The Report Generator is simple to operate and flexible.

For the person who wants the above GBS is an excellent product. If the purchaser really desires to utilise the 'programmable' facilities, he could well find that it is just not worth the effort involved. The user is entitled to expect that any product marketed at this price should have been proven beyond the point where it every now and again raises the input values by a factor of ten. Simple, untidy factors like the word "FILG" should have been removed from screen messages. Their continued presence suggests a program that was rushed onto an unsuspecting market, before it was ready.

I strongly believe that the best protection against software piracy is to market products that strike a balance between price and quality, such that a buyer believes he has obtained good value for money. In those circumstances the rights of the software author are likely to be respected. In its present form GBS does not seem to have reached that ideal position.

Stop Press

After writing this article, I received the following comments from Quality Software, the originators of the GBS program:

"As to the problem you describe as the 'amazing inbuilt data corruption factor', unfortunately this is a problem with GBS itself, not just on the Kaypro. I can suggest a mode of entering data that will overcome this problem. When entering numeric data, type in the number, then SPACE once, then TAB to the next field. Use several spaces when correcting numeric data, to guard against appending the incorrect digits onto the corrected number." The authors and the marketers of GBS seem unabashed that their program should require that amount of extra effort by the operator to protect the program from itself. □

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Sirius 1 with 2.4Mbyte drive capacity and 256K RAM is \$6400 plus tax
Sirius 1 with 10Mbyte hard disk and 256 K RAM is \$9600 plus tax

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WORDSTAR	\$500.00	DBASE II	MS-COBOL	\$925.00
WORDSTAR/MAILMERGE	\$725.00	SILICON OFFICE	GRAPHICS TOOLKIT	\$300.00
		CBASIC 86	AUTOCAD/AUTODIMENSION	\$2800.00

Errors and Omissions excepted

Still Not Convinced?

Well what about if we throw in a brand new CP80 printer worth \$500. If you're still doubtful, come in, have a chat, sit down with a Sirius for a few hours and see what it can do.



Busycalc On The Bee

cupying some 9000 bytes of memory. In a 16K machine this leaves room for a 10-column by 20-row spreadsheet, while a 32K Bee can accommodate 24 columns by 40 rows. The screen shows a window six columns wide by 14 rows deep at all times. Each column is nine characters wide, and each cell can contain numbers, a formula or text.

As the Microbee has no programmable function keys or cursor control keys, Busycalc makes use of the normal complement of letters and symbols. The cursor is moved by a diamond pattern of keys - I, J, K and M. The more conventional W, A, S, Z or S, E, D, X patterns can be substituted by editing a single line of the source code. Cursor movement is sluggish, requiring the keys to be held momentarily to get the cursor mobile.

Pressing the slash (/) key brings up a menu of 13 commands: Average, Compute Formula, Delete, Extend, Format, Load, Print, Quit, Recalculate, Save, Total, Verify and Escape. Each of the commands is well explained in the program notes, and all are easy to use.

A major limitation of Busycalc is the Compute Formula command. Formulae must commence with a cell location and only the operators +, -, # and / are allowed. Brackets are not permissible and evaluation of formulae is in sequence from left to right. This means that great care is required in setting up each formula, and it is sometimes necessary to use two cells for a single calculation. On the positive side, it is a simple matter to extend formulae across rows or down columns, and the Average and Total commands are very easy to use.

Worksheets can be saved (in whole or part) onto cassette at 1200 baud. A reasonably complete 16K sheet loads in about three and a half minutes, while up to 14 minutes would be required for a

full 32K worksheet. It is in this area that the disk-based systems shine, loading a complete file in a few seconds.

Recalculation of the spreadsheet may be automatic or on demand. The speed of calculation depends on the number of cells involved and the complexity of the formulae used. It is certainly not instantaneous. The documentation warns against 'forward referencing' - making a variable in Column A dependent on a value in Column B. Because the spreadsheet is evaluated column by column, such forward referencing can result in calculation errors.

Program Errors

It is not difficult to generate program errors, but an error-trapping routine generally allows recovery with the worksheet intact. And thanks to the Microbee's battery-backed memory, it is possible to turn the machine off and resume processing at a later date without losing the current spreadsheet. (To recommence execution in this case, type 'goto 20' rather than 'run').

The documentation supplied with Busycalc consists of 16 A4-sized pages by the program author Peter Baldwin. The notes are very good, explaining each command clearly and in adequate detail. There are a number of suggestions for modifying, but no worked examples of actual calculations. The style and detail of the notes are several steps ahead of the early Microworld BASIC and Editor-assembler manual.

Electronic spreadsheets are programs which will find increasing use as more applications are found for them. Though fairly slow in operation, Busycalc is an excellent introduction to spreadsheet concepts. It is easy to use and has just enough capacity to be practicable in the 16K machine. ☐

One of the most powerful classes of software available for microcomputers is the electronic spreadsheet. Programs such as Visicalc, Supercalc and Multiplan are finding wide application in the fields of financial planning, engineering design and cost estimation. Paul Fisher takes a look at Applied Technology's Busycalc.

THE BASIC CONCEPT of the spreadsheet is that a whole series of calculations can be performed with no 'programming' involved. If any item of data changes, then all variables dependent on that data can be recalculated automatically. The spreadsheet replaces ledger paper and adding machine calculations, and eliminates the need for some job-specific programs in BASIC or COBOL.

Probably the cheapest spreadsheet on the market is Applied Technology's 'Busycalc', written by Peter Baldwin at the Bankstown Technical College. At \$14.95, this is cheap software by anyone's standards, even if it lacks some of the bells and whistles of Multiplan.

Getting hold of Busycalc proved to be an exercise in persistence, involving cash up front, two reminder letters and finally a nudge from the Bureau of Consumer Affairs. A further letter was then required to secure the documentation, which did not accompany the program tape. One day the people at Applied Technology will get their act together and then they will be world beaters.

Down to Basics

Now to the program itself: Busycalc is supplied on cassette, and takes some six minutes to load at 300 baud. The program is written in Microworld BASIC and can be listed, backed up and modified. My first action was to make a 1200 baud back-up copy and store the original safely away.

Although the code is written for compactness rather than legibility, this is a big program by Microbee standards, oc-

Busycalc Report Card

Program:	Busycalc
Made by:	Applied Technology
Useful for:	All manner of calculations
Hardware required:	Microbee (16K or larger)

Ratings:	Excellent	Very good	Good	Poor
Documentation:		•		
Ease of use:		•		
Speed:				•
Functionality:			•	
Value for money:	•			

Price:	\$14.95
Available from:	Contact Applied Technology for dealers

Micro-Decision Macro-Result

By Robert Deane

"Warning: This article is written by a user who does not know a bus from a byte (even if it doesn't bite), but expects a computer to do its job like any other piece of modern office equipment and to be capable of operation without recourse to any language other than English."



"The Morrow Micro-Decision is an efficient, functional piece of equipment that does everything it is claimed to do, with a lack of fanfare and trumpet-blowing."

SOON AFTER taking up an exchange position in Sydney in the middle of last year, it became clear to me that access to computing facilities, especially word processing, cataloguing and sorting of data, would be critical if I was to finish my assignment on time. It became equally clear that obtaining reliable advice was in the same field as finding El-dorado – every computer shop assistant could tell you why his machine was the only one in the world to buy, but precious few could tell you anything about applications programs to achieve your individual requirements.

It seemed then, and probably still is true, that the real point to buying a computer was that you decided at what point you wished to pay your membership fee to join the obsolescence curve, secure in the knowledge that the day after you parted with your money somebody would bring out a machine to do twice as much in half the space with three times the 'free' software at the same price or less than you had just paid for that 'ultimate' machine. (Frank Lee's announcement of a Micro Decision with 5M hard disk and 400K floppy for under US\$3000 just as I was writing this article proves the point).

Despite a rising frustration index, by January this year I had a list of requirements for my first computer purchase, based on the range of tasks to be performed in the immediate future. I wanted: a machine which was not only sold in Australia, but by somebody who had an independently established reputation for providing service after the magic 90 days had elapsed; a Z80-based system running CP/M; twin disk drives (13 cm because of cost rather than preference); at least 64K RAM; serial ports; and some prospects of expansion in the future. A target budget of \$3000 was set, which had to cover the computer, some software, the terminal and a high-quality printer.

Choosing

A copy of the November 1982 issue of *Your Computer*, with its review of the Morrow Micro-Decision, had provided the first signs that the task was not impossible, and glowing reports of Automation Statham from colleagues who had dealt with the company for a period of years seemed to solve the remaining problems of reliable service.

A trip to Bankstown in early February and several hours with a more than patient Rod Whitworth, and the search was definitely over. The Micro-Decision minus the terminal, but only because of cost, was in the back of the car. Originally used with a borrowed Volker-Craig VC 4404 terminal, the system now consists of the Morrow, a Tatung VT4100

terminal and an Olympia ES100 SP typewriter, and has run on an almost full-time basis without a twitch.

When purchased in February the Morrow was delivered with twin drives, each single-sided, double-density with a useable capacity of 186K per drive, 64K RAM, two serial ports and the facility to add further external disk drives.

'Bundled' software was accompanied by excellent manuals from MicroPro for Wordstar, Mailmerge and Spellstar, even though the latter were not provided with the Morrow. The Digital Research manual for CP/M 2.2 and Microsoft's BASIC 80 were provided in the same format. A separate binder provided, in typewritten form, the manuals for the User's Guide to the Micro-Decision, Logicalc, Correct-It and Micro Mike's baZic. Pilot, which provides the excellent menus characteristic of the Morrow, was advertised as being included and is certainly on the systems disk, but there is absolutely no documentation provided.

The packing of the computer, software and manuals was excellent, with the computer placed in a smaller carrying case of industrial-quality kraft board inside the main packing case. This case continues to provide a safe and convenient method of transporting the computer.

Making It Work

Once unpacked and the various cables connected, the Morrow operating disk was inserted and all went according to the manual until it came time to make a working copy of Correct-It. Despite careful reading of the manual, the computer continued to display a disk error message for the distribution disk. A quick trip to Rod Whitworth and a new disk was immediately produced, which functioned perfectly.

The Morrow has an excellent system of on-screen menus, which enables even the complete novice to have the whole system up and running in under an hour without reference to the manual, once the necessary cables are connected and the power turned on. These menus can become tedious, however, once some proficiency with the operation of the system is achieved. The Morrow provides the necessary escape routines, leaving the helpful menus in the background for that inevitable memory lapse – operator's, not Morrow's.

Nothing is truly perfect. While the Morrow goes very close, there were a few small bugs in the software and the documentation which are annoying for the user, as opposed to the professional hacker. When uncorrected in the second issue of the manual, as some of these are, such bugs display a lack of quality control.



For example, one virtue of the Morrow in January 1983 – everybody can do it now – was the ability to emulate the formats of the Osborne 1 (single density), Xerox 820 and IBM-PC. The manual provides detailed directions for copying to or from one of these foreign diskettes by referring to a non-existent menu option. Not a huge problem once you learn to use PIP from the excellent CP/M Tutorial provided on the operating system disk, but an unnecessary hassle.

Similarly, if you attempt to copy files using the system's utility menu, chaos reigns. If you answer the prompt 'Copy all files Y/N' with Y, the screen displays the message 'SELDREV: Label not found' and returns you to the CP/M prompt A>. If you answer 'N' the screen tells you to 'Press return to use file shown or enter new file name'. No file name is shown and pressing return displays the error message: 'Not Found'.

An equally annoying characteristic of the otherwise excellent menu display of the Morrow is it tells you that the current drive is B, when in fact you are in A. It is easily changed without drama, but again indicates sloppy quality control.

On the plus side of this small list of gremlins, I have discovered that having assigned drive B as an IBM drive I can format a disk in IBM format. It doesn't work for either the Osborne or Xerox emulations, is not mentioned in the documentation and is absent from the next version of the operating system.

Does What It's Meant To

The Morrow is an efficient, functional piece of equipment that does everything it is claimed to do with such a lack of fanfare and trumpet-blowing you could be excused for forgetting that it is first a computer and second made in America. It is perhaps this quiet efficiency which makes the minor irritations mentioned above loom so large in the mind.

Once the whole thing is wired up and the power turned on, a simple task aided by the easily understood manual,

preparation of working copies of all the distributed software is a matter of following the clear and precise instructions displayed on the screen. The Morrow's excellent virtual drive feature is well used and the operating system even checks to ensure you have inserted the correct master disk before proceeding to make the working copy. Inserting the MBASIC distribution disk when you think you are copying Wordstar will halt the whole works, display an appropriate message on the screen and return you to the start of the process without any chance of damage to the precious master.

For most programs, like Wordstar, Logicalc and Correct-It, working copies are produced, configured for your particular terminal, automatically copied using SYSGEN, and automatically started.

Turning on the computer for the first time or pressing Reset automatically tests the memory, displays a memory OK message and asks for a CP/M systems disk to be inserted and Return to be pressed. The auto-start feature then takes you directly into your program. There's no fuss, it works well, and it saves time when you want to work, not play, with a computer.

I can say nothing about the quality of Automation Statham service from personal experience, because there has never been a need for it, apart from that odd distribution disk on day two. Based on my experience with this machine, at least two others were purchased by staff for personal use, and to date these have had the same trouble-free operation. My occasional telephone conversations with Rod Whitworth leave me more than confident that if the Micro-Decision does finally decide to stop, help will not be too far away.

High-Quality Finish

My work requires that the finished product should have the same appearance as that of high-quality electric typewriters. In January, daisywheel printers were an expensive commodity, so a daisywheel typewriter with a suitable interface was the only road to follow. After much searching – the Morrow requires a serial interface – an Olympia was suggested as worth investigating.

Again, finding the Olympia was a stroke of good fortune, for although the machine is made in Germany, the interfaces are designed and manufactured in the Artamon offices of Olympia Australia. My initial telephone enquiry was fortunately misdirected to the designer of the interfaces, Mr Ralf Alpert, rather than to the sales staff, which helped the whole deal considerably, for he is not only enthusiastic about his work, but has

Micro-Decision, Macro-Result

the happy knack of being interested in what you are trying to achieve.

The Olympia ES100 is a large, heavy and utterly robust machine. In its basic typewriter form, it has a 15 inch platen and accepts both 10 and 12 pitch 96-character daisywheels. A reasonable range of typefaces is available, as are the usual supplies such as single and multi-strike carbon and the normal fabric ribbon cassettes. Changing wheels and ribbons is a simple, fast and clean job, although colour change for the fabric ribbons requires removing the front housing, which could be a negative aspect in some applications. A variable-width tractor feed can be added later as an accessory.

In the SP configuration the machine has an RS232C plug neatly added to the rear panel and a switch to provide for on- and off-line operation. In the on-line mode the SP can be used as a terminal to input data to the computer, with special functions being assigned to some of the keys to provide for Escape, Control and Linefeed functions. A com-

bination of keys enables the SP to be toggled between full and half-duplex operation and the auto linefeed facility to be toggled on and off.

The SP can be set up to operate with Wordstar, using the TTY with backspace option. Proportional spacing and software-driven ribbon colour change are not possible, but both subscripts and superscripts are obtainable via the User Patch Area 4 of Wordstar. Boldface is possible with the fabric ribbons, but with the carbon ribbons is almost invisible due to the accuracy with which the daisywheels have been cut. Printing is mono-directional and not logic-seeking on the SP, giving an actual printing speed of 15 cps including linefeeds and carriage returns.

A range of special Customer Programs is available from Olympia, which will enable the SP to do particular tasks. The one fitted to my machine, Customer Program 7, when combined with series 804 typewheels, provides for full ASCII symbol printout.

A typewritten manual, accompanying

the usual glossy typewriter manual, provides clear explanations for all the operations of the ES100 in the SP mode, including a useful chart of pin configurations for connection to different computers.

As with the Morrow, I can offer no guide to the service provided for the SP, since none has been necessary since its installation, but if simplicity of design and robust construction are any guide, there will be little that the SP will need beyond an annual check.

Six months after the plunge, a millennium in the mad world of microcomputers, my office machines continue to perform according to specifications with complete reliability. I still do not know nor really wish to know how they do it - but in this world of the super-hype and the mega-exaggeration, the Micro-Decision and the ES100 SP are two excellent products which I would be happy to buy again today.

The Morrow Micro-Decision was reviewed in the November 1982 issue of *Your Computer*. ☐

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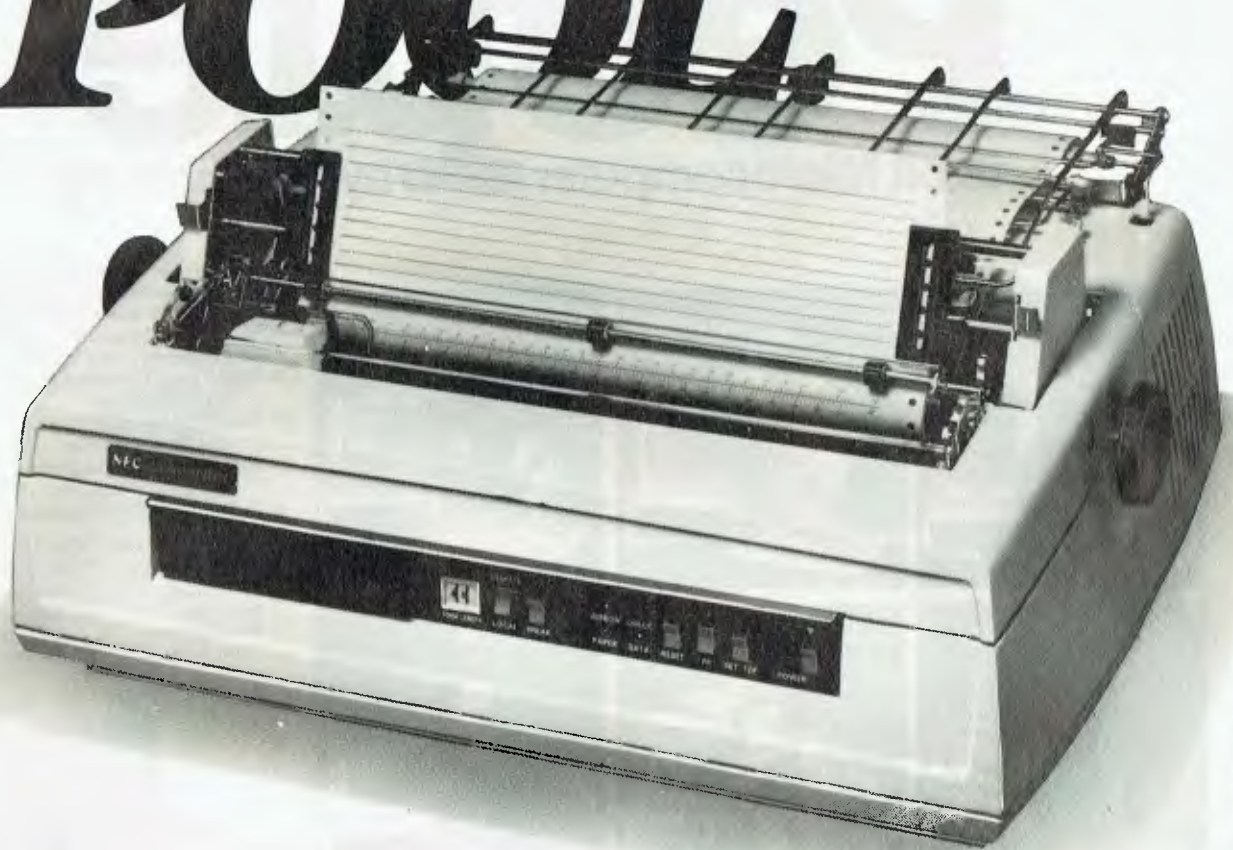
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your computer book reviews

Learning About Digital Electronics

By Eric B Lindsay

YOU HAVE BEEN reading about how simple digital electronics are in Les Bell's articles, but you either want to expand beyond that, or else want some more details of how gates and flip-flops and all the rest of those gadgets work. The big problem is that every book you've ever seen costs a fortune, and often doesn't contain what you need. Know the feeling?

Luckily there are some exceptions, and they turn up in unlikely places. For many years Texas Instruments has been producing a series of textbooks explaining many aspects of electronics for its own employees. These books are also sold to the public, although in a somewhat strange manner (I wrote to TI, and was referred to one of their Asian offices as the closest source of the books). You won't have to look that far, however, because Tandy is selling most of the texts under the Radio Shack brand name with a plain blue and white cover at prices ranging from \$2.50 to \$3.95. And at that price they are absolute bargains, since they are thorough, detailed, easy to follow, profusely illustrated, and designed for self-study. Since they are written by different people, some are easier than others, some are more detailed, but I have found them all very useful.

I would suggest starting with 'Understanding Solid-State Electronics', which concentrates on simple electronics, explains diodes and transistors as well as simple digital circuits, covers thyristors and optoelectronics, and then briefly discusses integrated circuits, with a late chapter on MOS and LSI, before quickly looking at linear integrated circuits. If you don't understand the funny terms above, this is the book with which to begin learning, for it does provide the background needed to make the others in the series a lot easier.

'Understanding Digital Electronics' covers some of the material in the first

book, but it would be rather hard going for a newcomer. It explains most of the building blocks in microcomputers by explaining precisely how a digital calculator works. This covers keyboard scanning, memories, displays, arithmetic circuits and so on. There are a series of questions after each chapter to test your understanding of the concepts, and a short glossary. You are introduced to truth tables, binary arithmetic, and machine-level programming concepts. The last chapter introduces larger computing systems, although this topic is best covered by the next book in the series.

'Understanding Microprocessors' gets down to the real topic. It moves somewhat away from fundamental electronics to cover the building blocks of a microcomputer system, arithmetic and logic units within the processor, addressing, memories, and then it covers instruction sets, assemblers and why they are needed, and how high-level languages are important. As an example of applications, a coin sorter is designed using an 8-bit processor; suitable input and output circuitry is discussed, and examples of how the program would be written are provided. As always, the approach is very visual, with illustrations and diagrams on almost every page.

'Understanding Computer Science'

moves right away from the electronic side to cover the history and architecture of mainframe computers, with chapters on programming and algorithms, languages, operating systems, management of computer resources such as peripherals and memory in mainframes, data structures in memory and how to search and sort. Language translators are covered in a separate chapter that also explains loaders, compilers, interpreters and assemblers, and systems analysis follows a problem from idea to solution.

Although not directly related to digital electronics, you may also find that 'Understanding Communication Systems' will provide valuable background on telephone systems and the problems involved in sending computer messages through them, and also provides a bit of background on how televisions and monitors work.

'Understanding Optonics' explains LEDs, LCD displays and photodetectors, and will provide a background to the optic transmission networks that will probably replace conventional copper connectors in many applications in the near future.

All in all, ten out of ten for TI/Tandy for putting together such a good series at such reasonable prices. □

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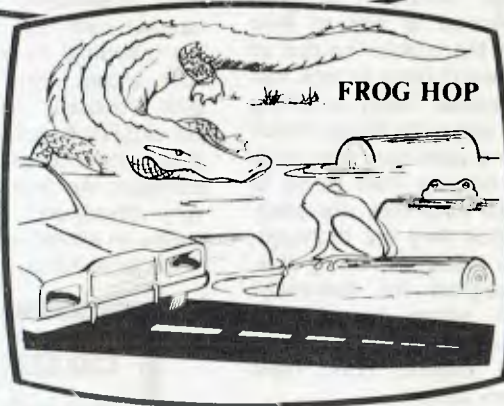
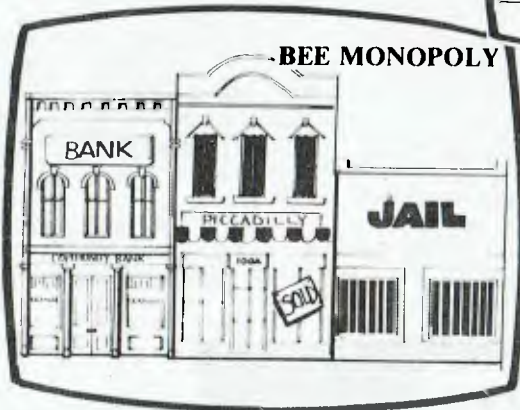


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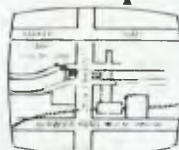
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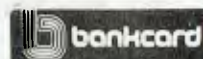
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Understanding Assembler

- Part XV

Moving on from writing straight Assembler, Les Bell introduces some higher-level tools for more complex projects.

MUCH AS I LIKE WRITING ASSEMBLER (really?), I do like tools that make it easier. Over the years I have built up quite a library of routines from various sources, ranging from public domain programs, such as are found in the CP/M Users Group, to Scelbi's 8080 Cookbook.

These handy subroutines can either be typed into programs or cut and pasted into place using a good text editor – which is the way I used to do it until I got what is an even more useful tool: a macroassembler. That's not just a big assembler, although it is a bit bigger than the standard CP/M assembler ASM; it's a smarter assembler.

The term macro, in computer science, refers to a text substitution done before assembly, compilation or execution of code. Macros are a form of shorthand; they enable a short word or phrase to stand for a long and possibly complex section of code.

Before the code is assembled (or compiled or whatever), the macro word or phrase is replaced by its full meaning. This is then assembled.

For example, a common requirement in most programs is to print a message at the console. In previous examples in this series, we have simply included a subroutine called `ilprt`, which printed the message stored after the call instruction which entered it.

On the other hand, we could do the same thing with a macro. At the beginning of the program, we define a macro which contains the subroutine, together with the appropriate call instruction. From then on, we can use the instruction

```
ilprt  'whatever text',0
```

throughout our programs. For those who are curious, and would read ahead, here's the macro, but you'll have to wait a bit for the explanation. It's worth mentioning one point here: the first time the macro is invoked, it generates both the subroutine call and the subroutine itself. Obviously, including the whole subroutine many times in a program (every time we want to print a message) is extremely wasteful, so from then on, it simply generates the call instruction.

```
;inline print macro
; print chars ending in 0 pted to by return address; return to byte after
;
print  macro    str
      local    over
      jmp      over          ;; jump over in-line subroutine

ilprtl: xthl          ; get ptr and save hl
;
ilplp:
      mov     a,m        ; get char
      ora     a          ; reached end
      jz      ilplx      ; yes, exit
      call    cout       ; print char
      inc     h          ; point to next
      jmp     ilplp      ; and go round
ilplx:  inc     h          ; pt to byte after ending 0
      xthl          ; restore hl and ret
```

```
ret
; over:
print  macro    ?s      ;; redefinition
      call    ilprtl
      db      ?s
      db      0
      endm

      print    str
      endm
```

Real Macro Assemblers

There are several macro assemblers on the market for CP/M. The most common is the Digital Research MAC assembler, which operates in much the same way as ASM, except that it can handle macros. In other words, it generates a HEX file, which is then loaded. MAC is an 8080 assembler, though it is supplied with a set of macros which can handle the Z-80 instruction set.

Another popular assembler is Microsoft's MACRO-80, which is a relocating assembler. Rather than generating a HEX file, it produces a REL file, which can then be linked to other REL files to produce the required COM file. This allows programs to be assembled in manageable and independent sections. MACRO-80 has a couple of other useful features: it can assemble Z-80 opcodes, and it can also assemble code which will load in one location for execution at another.

Digital Research's answer to MACRO-80 is RMAC, which is the standard assembler with CP/M Plus. It provides relocation facilities in much the same way as MACRO-80 – in fact their REL files are virtually the same format, but still use fake Z-80 op-codes.

All the above assemblers are modelled on the Intel original macroassembler, and so their instructions are similar. They differ only in the pseudo-ops they use, and so many of my comments about macros apply equally to all the above. There are other assemblers about, most notably the TDL/Xitan assemblers and Sorcim's ACT, but these are different to a considerable extent and so while the general principles apply, the details are different.

The examples which follow are based on MAC and RMAC, since those are the assemblers I use. They should be pretty well OK for the Microsoft assembler too, with only minor changes at the most. TDL and ACT users – you're on your own, I'm afraid.

Incidentally, this seems like a good time to make an impassioned plea to software authors not to write Z-80 code, but to stick to the 8080 subset. Not only is it annoying for those of us who don't run Z-80's to find that a program is unuseable, but the authors are missing out on sales. With the availability of 10 MHz 8085's, coupled with a Godbout dual processor board, the 8085 is a popular chip. Besides, the Z-80's extra instructions rarely produce worthwhile improvements anyway. End of lecture.

New Pseudo-Ops

The MAC and RMAC assemblers contain a couple of addi-

tional pseudo-ops which ASM does not have. First, there's SET (which ASM does have, but we haven't covered). SET works like EQU, except that attempts to equate the same symbol twice cause an error, whereas a symbol can be SET to several different values throughout an assembly. That's not so important in ASM, but for use in macros, it's well-nigh essential.

The PAGE and TITLE directives control the appearance of the PRN file. PAGE causes a page break, so the printer will skip to the top of the next page. Alternatively, PAGE followed by a number sets the page length. The TITLE pseudo-op allows the user to print the title of the program at the top of each page, thus:

```
TITLE      'Monitor Program V1.1'
```

More important, however, are the three built-in macro instructions REPT, IRP and IRPC.

REPT allows automatic repetition of a sequence of instructions. It takes the following format:

```
REPT expression
statement
.
.
statement
ENDM
```

For example, here's a section of code to generate a blank jump table:

```
; generates blank jump table
      org      0100h

njumps set      5

table: rept      njumps
      jmp      error
      endm

; error:
;
      end
```

This is quite simple: the set statement sets the number of jumps to five, then the rept macro generates that many jumps. The PRN file produced by the MAC assembler looks like this:

```
; GENERATES BLANK JUMP TABLE

0100      ORG      0100H
0005 #      NJUMPS SET      5

TABLE: REPT      NJUMPS
      JMP      ERROR
      ENDM
0100+C30F01      JMP      ERROR
0103+C30F01      JMP      ERROR
0106+C30F01      JMP      ERROR
0109+C30F01      JMP      ERROR
010C+C30F01      JMP      ERROR
;
; ERROR:
;
      ENDM
```

Notice that inside the lines generated by the macro, there is a '+' sign between each address and the hex codes. This indicates that the code was generated by macro expansion.

The REPT pseudo-op is fine when you want a number of identical sequences of code. However, you will often want some variations throughout the repeated code, and this can be achieved with the IRP command.

The format of the IRP command is similar to that of REPT:

```
IRPC var,<datalist>
statement
.
.
statement
ENDM
```

In this case, one or more of the statements in the macro involve the variable identified in the macro header. Each time the macro is expanded, an item from the datalist is substituted for the variable. For example, here's a more sophisticated jump table:

```
; generates a jump table
```

```
bios      equ      0000h
bdos      equ      0005h
tpa        equ      0100h
reboot    equ      0F800h

      org      0100h

      irp      ?d,<bios,bdos,tpa,reboot>
      jmp      ?d
      endm

      end
```

In this case, ?d is the variable which will be used for macro substitution. In other words, the macro processor will keep generating jmp statements as long as it is able to substitute one of the labels bios, bdos, tpa and reboot for ?d. Here's the resulting PRN file:

```
; GENERATES A JUMP TABLE

0000 =      BIOS      EQU      0000H
0005 =      BDOS      EQU      0005H
0100 =      TPA        EQU      0100H
F800 =      REBOOT     EQU      0F800H

0100      ORG      0100H

      IRP      ?D,<BIOS,BDOS,TPA,REBOOT>
      JMP      ?D
      ENDM
0100+C30F00      JMP      BIOS
0103+C30F00      JMP      BDOS
0106+C30F01      JMP      TPA
0109+C30F08      JMP      REBOOT

010C      END
```

As you can see, the MAC assembler has correctly generated the jump table.

Finally, the IRPC macro works just like IRP, except that it is used to substitute single characters into the macro expansion. Its format is:

```
IRPC var,charlist
statement
.
.
statement
ENDM
```

Here's an example which shows how to save the 8080 registers with one instruction:

```
      org      0100h

; save 8080 registers

pushall: irpc      reg,bdh
      push      reg
      endm

popper:  irpc      reg,hdb
      pop       reg
      endm

      end
```

There are two things to notice here. First, I couldn't include the accumulator in this save macro because it is referred to as PSW in a push instruction, so I'd have to use the IRP macro for that. Second, notice that the popper macro substitutes the registers in reverse order, for obvious reasons.

Here's the resulting PRN file:

```
0100      ORG      0100H

; SAVE 8080 REGISTERS

PUSHALL:  IRPC      REG,BDH
      PUSH      REG
      ENDM
0100+C5      PUSH      B
0101+D5      PUSH      D
0102+E5      PUSH      H

POPPER:   IRPC      REG,HDB
      POP       REG
      ENDM
0103+E1      POP       H
0104+D1      POP       D
0105+C1      POP       B

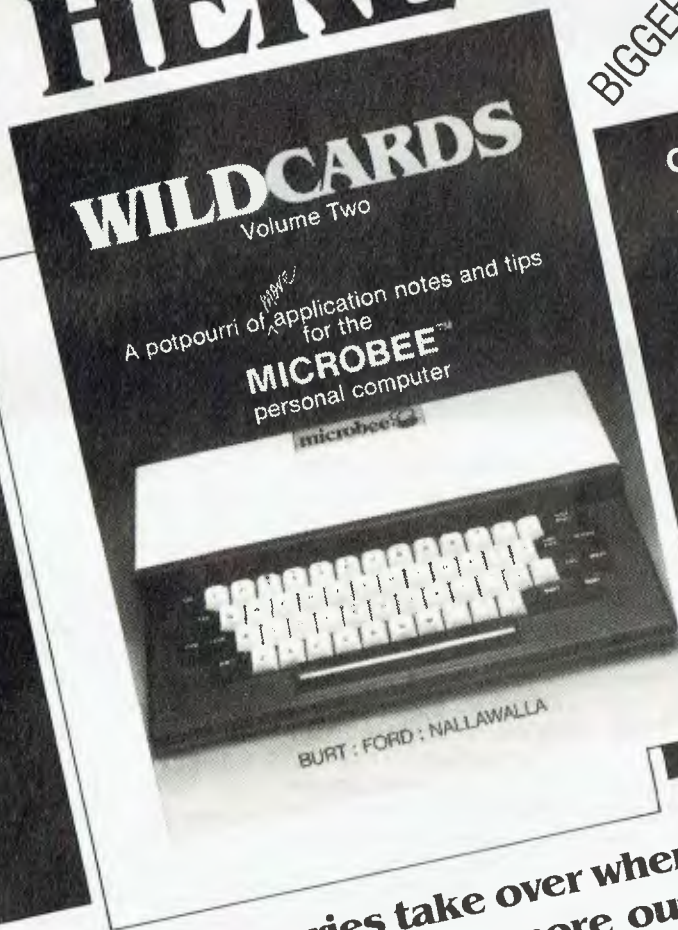
0106      ENDM
```

Next month, we'll get on to defining our own macros and looking in depth at parameter substitution. □

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Playing With Your Microk



Have you ever wondered how to make your Microbee display 80 characters across the screen, or change its cursor, or produce more rows of text on the screen? Eric Lindsay explains how these changes can be accomplished from within your programs.

UNFORTUNATELY IT IS difficult to explain how the 6545 video chip in the Microbee works, but we can see a few of its effects with a simple POKE to memory. Since many other computers such as the IBM-PC, the Big Board II and some Apple video boards use similar chips, you may be able to use similar techniques with them.

If you experiment a lot, you may end up with your video display completely out of control. Remember you can always fix everything up by doing a 'cold' start (press <ESC> and <RESET> for a few seconds, so that you get the 'Micro-World' copyright message on your screen). Now to work!

POKE 220,97 and you suddenly have a full block-style cursor. POKE 2200,111 gets it back to normal. Values between 97 and 111 will give different heights for the cursor. Normally things are not this easy to change, and in most of the cases I describe you will have to load values into the 6545 chip. Luckily you can use the existing routines in the Microbee to do this, just by putting the

values you want to change into memory, and then doing a 'warm' start (this just means you press the <RESET> key for a second or two, and release it to get a 'READY' message).

When you do a cold start, your Microbee moves certain values from its BASIC EPROMs into its user memory and loads these values into the 6545 video display controller. If you look in the BASIC EPROMs at location 47820 (BACC hex), and at the next 15 memory locations, you will find the initial values loaded into registers R0 to R15 of the 6545. These values are moved to user memory at 210 to 225 (D2 hex to E1 hex), where we can change them easily. All this is rather dry and not very exciting, so let's try to make a few changes.

Moving Your Display

PRINT PEEK (212) produces the value 75. POKE 212,65 or POKE 212,85, and then do a warm start by pressing <RESET>. This will move your video display starting point sideways, the same as is done by <ESC> <A> or <ESC> <S>. You can check this by using <ESC> <A> or <ESC> <S>, and then PRINT PEEK (212), and comparing the results. You can move your entire video display up and down by POKE 217,17 or POKE 217,19. This is the location used by <ESC> <W> and <ESC> <Z>. Again, to see the result, you have to press <RESET>. POKE 217,18 to restore the correct value.

The cursor can be altered via locations 220 and 221, and you have already seen some of the changes that are possible. Memory location 220 contains the number of the scan line at which the cursor will start, while 221 contains the number of the scan line at which it will end. It normally starts and ends at scan line 15, thus giving a single-line cursor at the bottom of each line. However, you can put any numbers between 0 and 15 into these locations, and have your cursor of any height and at any position in the line of characters. Just try POKE 220,5:POKE 221,10 and you will see what I mean.

Back already? No doubt you are wondering why the cursor is no longer blinking? Well, I cheated a little, because memory location 220 originally contained 111, not the 15 I told you. However, 111 is $64 + 32 + 15$. Ask a silly question . . . If you add 64 to your POKE (POKE 220,64+15) you get a blinking cursor. If you add only 32 you get no cursor at all, and if you add 64 and 32 you get a blinking cursor, but at different speed. All easy, provided you remember to press <RESET> after poking the memory.

Now we come to the hard bit: changing the number of characters in a line, and the number of lines on the screen. It's hard because you have to understand, in outline, how a television or monitor works. Otherwise you will just have a list of POKes, and no idea of

Microbee's Video Display



how to change them to suit your own needs.

How A Television Works

When a microcomputer presents anything on a video display, it has to send a signal to the display, telling it to make a dot of light wherever a dot should appear. Monitors or televisions make up their display from many separate pictures, or frames. A television makes 25 frames each second. Each frame is made up of about 625 horizontal lines. You usually don't see this many, because some of them are lost in the black band which appears when a television picture rolls up and down the screen.

Since having only 25 frames tends to produce a flickering effect, much like old-fashioned movies, each frame is split into two sets of 312 lines which are interlaced, so that each alternate frame shows the odd or the even lines. This reduces the flicker to an acceptable level. In microcomputer displays, the odd and even frames are mostly identical, although it is possible to vary this, as you will see later.

Now, to display anything on the screen, the microcomputer has to turn a dot on and off along each scan line. It has to produce enough dots to fill the entire line (512 for the Microbee), and

then turn off the dots at the end of the line. It then has to signal the television to go to the next scan line, leave enough time for the television to do so, and start producing the dots for the next line, and so on to the bottom of the display. There it has to turn off the lines, tell the television to start the next frame, and leave enough time for it to do so. All these exercises have to be precisely timed to suit the television or monitor, and of course all the signals produced have fancy names.

We can tell the scan line the Horizontal Total, and it includes the time to return to the next line (the Retrace time). The signal the computer sends to end this is called the Horizontal Sync Pulse, and this can be of varied duration, called the Horizontal Width. The length of time the whole frame takes is the Vertical Total, and since this tends not to be set too accurately, it is 'fine tuned' by a Vertical Sync Adjustment. The resulting figure is the time for the whole frame, including the time in which nothing is displayed.

We can also adjust the number of rows of characters displayed, and when the frame ends (the Vertical Sync Signal). As with the Horizontal Sync, there is also a Vertical Sync Width adjustment, used to make it easier to suit sig-

nals to a particular television or monitor. When you move the display left or right on the screen you are really adjusting the Horizontal Sync timing, and when you move it up or down the screen, you are adjusting the Vertical Sync timing.

Now we have to add a few calculations. We know we produce 50 frames a second, of 312 lines. We also know that each character in the Microbee is 16 lines high (count them), and that we produce 16 rows of characters. This means we see 256 of the 312 lines. We also know that we can produce 64 characters, and that each can be up to eight dots wide, or 512 visible dots on each line.

I will tell you now (would I lie?) that we need enough time on each line to produce 96 characters, allowing for retrace times and other delays. We also know, from the circuit diagrams supplied by Applied Technology, that the 6545 chip has a 12 MHz signal, which is divided by eight, giving 1.5 MHz (in the original description in the February 1982 Your Computer this was said to be 1.25 MHz, but if that is correct, then all my calculations stop working).

6545 CRT REGISTERS and the MICROBEE

REG No.	REGISTER Name	R/W?	ROM Hex	CONTENTS Hex	Dec	RAM Hex	Description of register
00	Horiz Total	w	BAC0	5F	095	D2	Horizontal total, to take 64000 ns
01	Chars/Row	w	BACD	40	064	D3	No of displayed characters
02	HYSNC Pos	w	BACE	4F	075	D4	Horz Screen Position ESC A 5
03	H/V SYNCH wd	w	BACF	37	3+7	D5	hsync/vsync for monitor
04	Vert Total	w	BAD0	12	018	D6	No of Rows, to equal 312 scan lines
05	VSYNC Adjust	w	BAD1	00	009	D7	for adjustment of scan line no
06	Char Rows/frame	w	BAD2	10	016	D8	Character rows to display
07	VSYNC Pos	w	BAD3	12	018	D9	Vsync, ESC w 7 value
08	Mode Control	w	BAD4	48	072	DA	Allows interlaced scan, etc.
09	ScanLines/Row	w	BAD5	0F	015	DB	Adj this for 24 lines, etc.
10	Cursor Start	w	BAD6	6F	111	DC	Cursor blink & start
11	Cursor End	w	BAD7	0F	015	DD	Scan line where cursor ends
12	Start Address	w	BAD8	00	0	DE	MSB Top of screen page
13	Start Address	w	BAD9	00	0	DF	LSB "
14	Cursor Pos	R/W	BADA	00	0	E0	MSB Cursor Position
15	Cursor Pos	R/W	BADF	00	0	E1	LSB "
16	Light Pen Pos	R	-	-	-	-	MSB Light Pen
17	Light Pen Pos	R	-	-	-	-	LSB position
18	Update Loc	w	-	-	-	-	Update screen address
19	Update Loc	w	-	-	-	-	to be accessed next

Details of the Microbee's 6545 CRT Registers.

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The result of all this is that you give a signal to the 6545 to produce a new character every 666.7 nanoseconds, thus taking 64,000 nanoseconds per scan line of 96 characters, or 20,000,000 (1/50 second) per frame, or one second for 50 frames. Well, all the mathematics work out pretty well. Now we have to look at how the 6545 chip uses this sort of thing.

Inside The 6545

In the 6545, register 0 contains the number of characters per line, less one. PRINT PEEK (210) will give 95, implying that 96 character times are used per scan line. Because we need to keep this timing pretty much correct, this figure should not be altered.

Register 1, at memory location 211, normally contains the number of characters displayed, or 64. This can be changed to any number you please. However, if you change it by very much, you may also have to adjust the position of the horizontal sync pulse, which is set by register 2 at location 212. You will also find that although you can POKE 211,80, you will not see 80 characters, because some of them will run off the end of the display.

Since the BASIC believes the display is producing 64 characters, you will find that each line starts in a different place. To correct this, the actual BASIC EP-ROMs must be changed.

Register 3 contains the horizontal and vertical sync widths, is set to 55, and should not be altered. These settings are used to match the signals from the computer to those needed by monitors; in this case it produces a horizontal sync pulse that takes the same time as three characters, and a vertical sync pulse that takes the same time as seven scan lines.

Things are more complicated when we consider the vertical timing. Register 4, set by location 214, contains the number of rows of characters per screen. It is set to 18 because it includes rows we don't see. Also, the figure it contains is one less than the number of rows produced, so it actually produces 19 rows of characters.

I mentioned that each character is 16 scan lines high. This figure minus 1 is placed in register 9, at location 219, so this contains 15. Between the two of them, these registers must produce 313 scan lines, otherwise the television or monitor will roll badly. A little light calculation music, and we multiply 16 scan lines by 19 rows and get 304.

Luckily we still have register 5, the vertical sync adjustment register at location 215, which increases the number of scan lines by whatever number it contains. It contains 9, and thus everything

works out. You can change the contents of all three of these registers, if the number of rows (contents of register 4, plus 1) multiplied by the number of scan lines per character (contents of register 9, plus 1), when added to the contents of register 5, equals 313.

Now, we turn to register 6, at location 216. This contains 16, which is the number of rows of characters we want to display. You can reduce this freely and get fewer rows on the screen. However, if you want to increase it, you have problems. For one thing, BASIC knows it can display only 16 rows, and for another, we still only have a limited number of lines on the screen.

Let's change that. POKE 214,24: POKE 215,1: POKE 216,24 or 23: POKE 217,23 or 24 or 25 - you may have to experiment - POKE 219,12. Now press <RESET>. With a bit of luck, you will have a stable display with 16 lines all squashed up into the top and middle of the screen, and random shapes on the bottom third of the display. BASIC is still only showing 16 lines of text, since it puts text only in the first 1000 bytes of your video memory. The bottom of the screen is displaying the contents of the second 1000 bytes of your video memory. You can POKE your own messages into this area fairly easily, as you can see by starting with something like FOR X=63488 TO 64000:POKE X,32:NEXT X.

Incidentally, one of the things we just did was to ensure that each character displayed was only 12 scan lines high. This means you have lost the tails (descenders) on characters like j and y. It also means that if you really demand 24 lines on the display, you have to change the character generator supplied with the Microbee (luckily this is fairly easy, but still not a task for beginners).

While there are a host of other interesting registers in the 6545, I will deal with only one more of them, and that is register 8, at location 218. This is the mode control register, and normally contains 72. Try changing this to 73 or 74 or 75. Changing to 73 provides an interlaced scan. This means that each character is only half as high as before, and you could theoretically fit 48 lines on the screen with ease. Unfortunately, the display usually shakes so badly in this mode that it makes viewing intolerable.

Details of all the registers on the 6545 chip are included in the chart at the end of this article. Experiment a bit, even though you'll find some of the changes you can make will have no effect apart from stopping your video display from working. Remember, you cannot hurt your Microbee by playing with the keyboard, and you can fix your video by doing a cold start. □



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Logic For Literati Part VI

In his continuing not-so-logical (it hasn't appeared for the past two months) series, this month Les Bell gives an introduction to clocked logic.

IN NOVEMBER we finished by looking at the RS flip-flop, a simple bistable circuit. The RS flip-flop very rarely appears labelled as such; generally it is fabricated out of spare gates in the area. When a flip-flop is specifically required, it is usually one of a couple of more advanced types – the JK and D types.

Both of these are examples of clocked logic circuits. All the circuits we have discussed so far are unclocked, or combinatorial, logic. Now we are starting to discuss circuits which have memory and hold their states, and which only change states at certain times – that is, when the clock signals.

The RS flip-flop can be converted into a simple clocked type by adding a couple of gates on the inputs, so that the clock signal controls the inputs to the RS flop (Figure 1). This is not really a great improvement, as whenever the clock input goes high, the outputs will continue to track the inputs should they change.

This is particularly critical in circuits where we want to cascade many flip-flops to act as a shift register. When the input flip-flop changes state, the remaining fops will follow immediately, subject only to the gate delays of TTL circuitry (that is around 14 ns – 14 one thousand millionths of a second- per gate). The result is that rather than sedately rippling through the register, the data will race through immediately.

What we need is a way to delay the switching of one flip-flop until the previous one has stabilised. This is simply achieved by putting two flip-flops in series (Figure 2), with their clock inputs driven by complementary clock signals. Now, when the first flip-flop is enabled, the second is not. So, the input signal cannot progress through the circuit until a clock cycle has been completed. This is known as a master-slave flip-flop.

Types of Clocking

So far, we have been looking at circuits which are controlled by the level of the clock signal. While the clock is high,

your computer



the first stage of the flip-flop can change state. While it is low, the first stage is shut off and the data is transferred to the second stage.

If only real life were that simple. . . There are, in fact, two different types of clocking – level clocking and edge

clocking. Level clocking works as described above, except one should also bear in mind that circuits could be clocked by negative logic signals (that is, by an inverted clock). While the clock is high (low) the first stage of a flip-flop is accepting data. On the second half of the clock cycle, the clock is low (high), the flip-flop has transferred the data to the slave section and changing the inputs has no effect.

Edge clocking works differently. Here the transfer of data occurs when the clock changes from low to high or vice versa. It is the edge of the clock waveform that controls the circuit.

As we shall see later, the kind of edge triggering (positive or negative) depends on what the circuit is being used to do. If it is part of a shift register (as in a serial port UART), generally it will be clocked on the positive edge, while counter circuits are usually clocked on the negative edge.

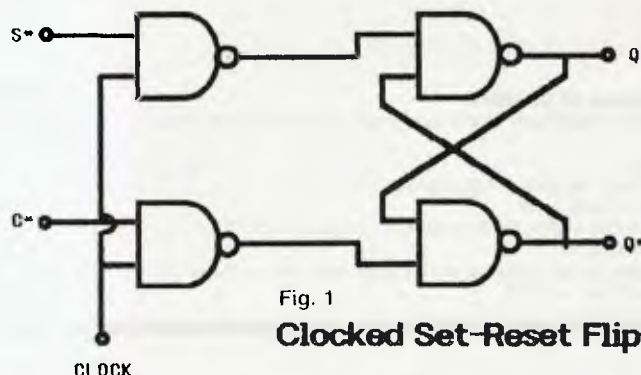


Fig. 1
Clocked Set-Reset Flip-flop

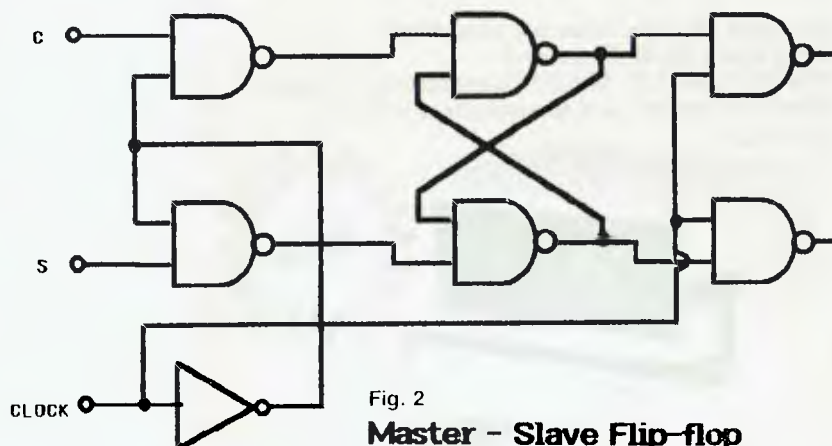
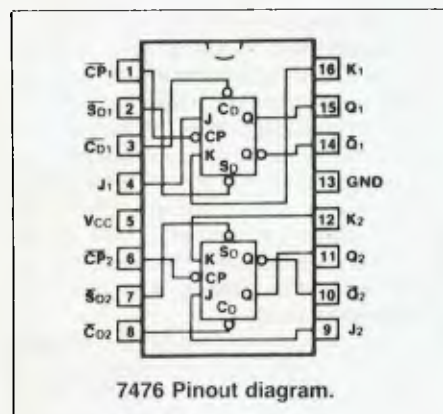


Fig. 2
Master - Slave Flip-flop

The JK Flip-Flop

The JK flip-flop is an ideal version of the master-slave arrangement described above. It is a level-triggered flip-flop with two clocked inputs, called J and K for no particular reason, and two direct inputs called Preset and Clear. It has the usual Q and Q* outputs.

The JK flip-flop has a couple of other advantages over the simple master-slave type above. You will recall that if both inputs to the RS flip-flop go high, the result is an illegal condition. In the case of the JK type, the result of both inputs being high is that the output switches state, which is a much more useful arrangement – particularly for building counters.



The direct inputs can be used independently of the clocked inputs, to immediately change the state of the outputs. Note, however, that the direct in-

puts suffer from the drawback of the simple RS flip-flop, in that if both the Preset and Clear inputs are sent true, the outputs go into a disallowed state.

The 7476 is a dual JK flip-flop in a single 16-pin package; the 7473 and 74107 are basically the same dual JK flop without the preset and clear inputs in a single package. The truth table for the 7476 looks like this:

For the clocked inputs:

J	K	CLOCK	Q
0	0	neg. edge	No change
0	1	neg. edge	0
1	0	neg. edge	1
1	1	neg. edge	flips

For the direct inputs

Preset	Pre-clear	Q
0	0	Disallowed
0	1	1
1	0	0
1	1	Normal clocked operation

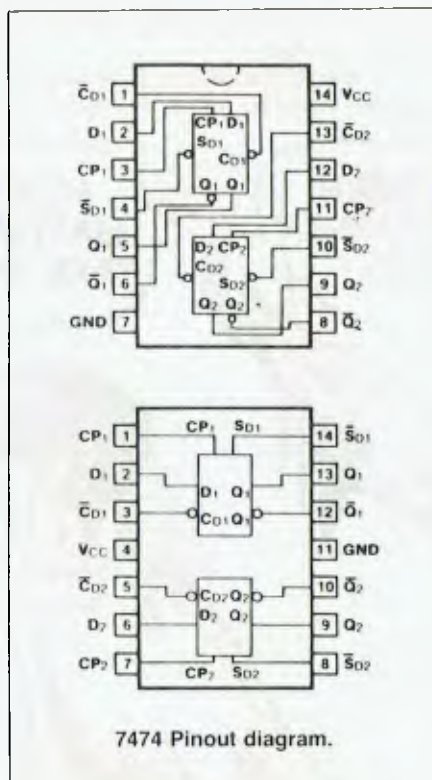
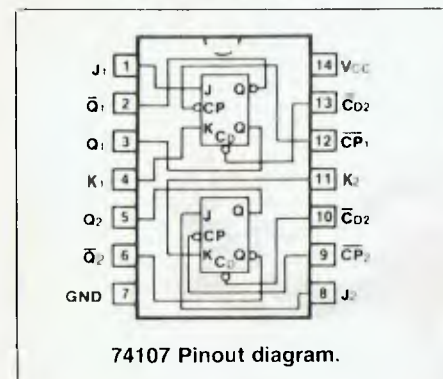
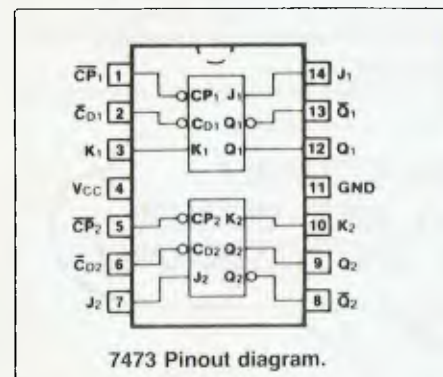
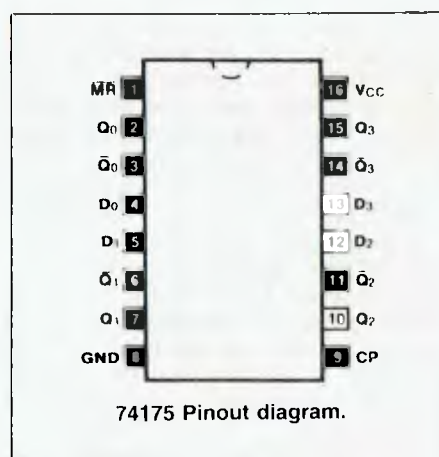
The D-Type Flip-Flop

While the JK flip-flop has two separate inputs, the D-type flip-flop has an inverter added so that the K input is always the complement of the J input. Thus, only one input is required, the D input, although both Preset and Clear inputs and Q and Q* outputs are provided.

While JK flip-flops are generally level-triggered, the prevalent 7474 D-type flip-flop is edge-triggered. That is, the signal on the D input is loaded into the master stage of the flip-flop as the clock signal goes positive.

The 7474 is a dual D-type, but for bigger systems the 74174 is a hex-type and the 74175 is a quad-type. The D-type is particularly useful as a divider circuit – simply connect the Q* output back to the D input and the Q output will be at half the frequency of the clock input. You can prove this for yourself by wiring up a switch debouncer with an inverter and LED on the output, and feeding this into a half 7474 with an inverter and LED on its output. Start flicking the switch, and you'll see that the second LED will flash at half the rate of the first.

By connecting D-type flip-flops in series, connecting the Q* of each stage to the clock input of the succeeding stage, with the Q* output fed back as described above, it is possible to divide by 2, 4, 8, 16 and other powers of 2.



This chain of flip-flops is called a binary counter, because looking at all the Q outputs as a binary number, it will appear to count up from 0 to all ones. Incidentally, if you connect the Q output of each stage to the succeeding one, with the Q* fed back in the same way, the circuit will count down, rather than up.

This is also called a ripple counter, because the count ripples through the circuit. It is an example of a weighted counter, because each stage has a weight value: the first stage of 1, the next stage of 2, then of 4, then 8 and so on. To find out the state of the counter, simply add up the weighted values of the outputs.

Unweighted counters are also possible and are particularly useful in some situations: generally for dividing by unusual numbers. It is possible to reset a binary counter by feeding the outputs to a large AND gate and using this to generate a reset pulse for the CLEAR inputs of the counter stages whenever the appropriate count has been reached. However, the complexity of decoding the terminal count often means that an alternative circuit is simpler. □

"Quick Robin — Into T

Much of the Osborne 1's success can be attributed to its portability. But until recently its ability to stray from the confines of mains voltage was directly proportional to the length of extension cord available. This irony was rectified when the Battpac, a portable power pack, became available for the Osborne. Derek Morris reviewed it for us.

YOU DON'T have to be a recluse with a passion for camping and CP/M to reap the benefits the Battpac has to offer. The advantages that come from having an isolated, independent power supply for a computer are numerous.

The very thought of the first rains in winter, power strikes, and people who trip over power cords must strike fear into all our hearts. Often the event doesn't even have to be externally noticeable to have disastrous results. A change in mood of the household refrigerator or washing machine can be enough to terminate a day's efforts on the computer.

More importantly, the valuable information held within the computer before the power fluctuation will be lost forever. Such a situation threatens the very existence of any efficient record keeping system.

What It Looks Like

The Battpac is a peculiar object at first sight. It looks a lot like a binocular case, or a car's radar detector. Perhaps its appearance is only fitting as, to the uninitiated, the Osborne looks more like a sewing machine than a computer.

The Battpac's case is light blue in colour, the same shade as the latest Osborne. Its black fascia contains a three-way switch, and several LEDs to indicate the battery condition and the mode it is in.

The three-way switch is on the left of the fascia and it selects the mode the Battpac is in. It can be switched off, on or to the recharge mode.

Next to this switch is a bank of three LEDs. The first LED lights up when the Battpac is being charged, the second when the Battpac is standing by, and the third LED will light up if the Osborne is drawing power from the battery.

To the right of this bank of LEDs are another four LEDs which indicate the battery strength. Each of these four LEDs represents a 25 per cent loss in the battery's power. If the top LED is lit the battery is 100 per cent, if the one below it is lit there is 75 per cent, through to the bottom LED which (appropriately red) indicates the battery is down to 25 per cent of its operating strength. At this point the battery requires a charge.

The rear of the unit is dominated by a large heatsink, which is nearly the

width of the entire case. From here a generous length of cable stems to connect the Battpac to the Osborne.

The documentation supplied with the unit is sparse, but adequate. It takes little instruction to operate the Battpac, and the documentation covers all the necessary points thoroughly.

Modes Of Operation

The Battpac has two modes of operation; it can either be used independently or in conjunction with mains voltage. In its independent mode it simply plugs into the Osborne's battery port, and the power is switched on at the battery.

Once connected, there is no need to turn on the Osborne's power switch. The battery port on the Osborne is configured not to accept voltage unless the mains power is absent. The power switch on the Osborne therefore has no effect when the Battpac is used in the independent mode.

In its independent mode the Battpac will power the Osborne reliably for, on average, about eighty minutes. Obviously this figure will vary to some extent depending on the type of use the Osborne receives. If, for example, the work you were doing involved a lot of disk activity, the battery life would be much less than eighty minutes. Or, if the disk drives played a less demanding role, one could improve on the eighty minute average.

I decided to test this point and deter-



GOSH! ROBBIN
THE COMMISSIONER
NEEDS USS!

HOLY HEATSINK!
BATMAN, WE'D BETTER
TAKE THE BATTOSBORNE!

The Battpac!"



mine how long the Battpac would last given the most unfavourable conditions. The test would have to use both drives on the Osborne, and show any errors. The first error detected would signify the end of the test.

A perfect program to test this is the 'COPY' program supplied with the Osborne. It copies the contents of one drive to the other, and reports on any read/write errors. While this program is running, one of the two drives will always be spinning — making it a fair representation of the maximum load the Battpac is ever likely to receive.

The results of the test were impressive. The Battpac survived for 45 minutes before showing the first error. While this may seem a small fraction of its average time, the practical application of this must be realised.

In that sort of time it would be possible to save whatever you were working on before the power dropped, and after doing so, go on to make back-up copies of about thirty full disks. Whether such enthusiasm will ever be shown by someone surrounded by total darkness is another question, but it is possible.

In its second, and possibly more useful, mode of operation the Battpac remains plugged in while the Osborne uses mains power in the normal manner. In this mode the Battpac is in standby, and uses very little power. In fact the only power it draws from the battery is used to light the tiny LEDs on the front fascia.

It will remain in this state until, for some reason, the mains power should fail. When this happens, the Battpac will switch in and supply the Osborne with its own power. The transition is instant, without any loss of or damage to the data in memory.

I tried several times to fault this process, without success. My most sadistic attempts to induce an error were met with only a slight flicker on the screen. I tried switching the power on and off quickly, pulling the cord out of the Osborne, and many similar variations, to no avail.

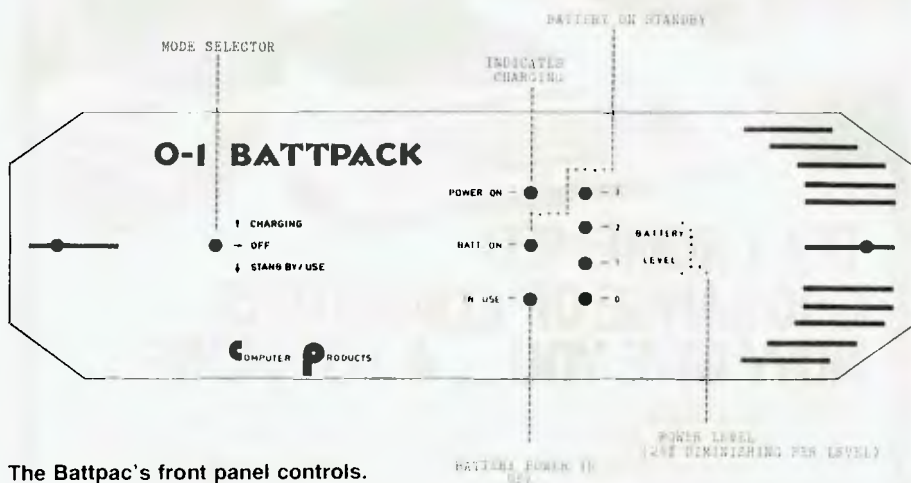
It must be noted (to avoid any possible confusion) that the Battpac does not

have the ability to store data in memory once the reset button is pressed. Some computers (such as the Microbee) have this facility because of the type of memory chips they use. The memory in the Osborne is volatile, and will not 'last'.

The Battery

From the moment you pick it up there can be no doubt as to the type of battery used in the Battpac — its weight being the biggest clue (4.6 kg). My suspicion proved correct after I removed the case; mounted in a very sturdy steel frame was a sealed lead acid battery.

With its cover off, it became apparent that the standard of construction is high.



The Battpac's front panel controls.



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Removing the covers is much like raising the bonnet on a BMW. Everything is neatly laid out and well positioned. All the electronics are mounted on a printed circuit board about the size of a cigarette pack, which is secured to the robust frame. The internal wiring is tidy, making it quite easy to trace the internal workings of the unit.

The battery used in the Battpac has a life expectancy of four to five years and requires no maintenance during this time. Its temperature range of -25 to 60 degrees Celsius suggests it will continue to work long after you and the Osborne have thrown in the towel.

Recharging the Battpac takes up to four hours, depending on its state of discharge. This makes for a useful ratio between its running down time. The Battpac has its own charging unit built in so there is no need to worry about carrying a separate battery charger around.

Price And Other Quibbles

The Battpac has some minor faults which stop it from being an otherwise excellent unit. The major one has to be its price.

Most people could justify the price against the possible loss of valuable business records, but I can't help feeling sorry for hobbyists who would like the features the Battpac has to offer, but can't come to terms with its price (\$450 rrp).

My second criticism is possibly not aimed at the Battpac itself, but at the Osborne. Both the battery port and the modem port use the same type of connector. Even though they are separate, at extreme ends of the Osborne's console, it's possible to plug the battery into the modem port. Surprisingly, even if this were to happen, there would be no damage done to the Osborne.

The front fascia on the Battpac is a little 'loud' for my tastes, but I wouldn't call it ugly. I think a simpler, less obvious front would go a long way in improving its looks. At the moment it comes close to looking like a kit project — an observation that shouldn't arise for a product with its price tag.

Although I don't think the advent of the Battpac will fill our national parks with Osborne owners, it could well enable many people to carry out their work 'in the field' and return to their base with fully prepared reports. I'm sure it will be a great help to people whose computing activities were previously restricted by the need to use mains power.

Perhaps the initial price is at least partly compensated for by the high standard of the Battpac's construction, its versatility, and the peace of mind it can offer anyone who fears the inevitable. □

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Vertical : 50 Hz/60 Hz

Horizontal Retrace Time : Approx 8.5 us

Vertical Retrace Time : Approx 800 us

PHOSPHORS AVAILABLE

Amber, Green

RESOLUTION

Centre : 1000 Lines

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contrast

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SLIM, HALF-HEIGHT DRIVE The disk drive is only 41 mm high, it is only half the size of conventional models.

NO CONTACT WRITE-PROTECTED SENSOR Photo coupler is used as write-protected sensor. It means no damage, long lifetime and good reliability for disk media.

GENERAL SPECIFICATIONS

Capacity (formatted) : 163K (20K bytes more than the original)

No. of tracks : 40 tracks (5 tracks more)

No. of sectors/track : 13 or 16 sectors

Disk rotation speed : 300 rpm

Track density : 48TPI

Track to track time : Less than 6 msec



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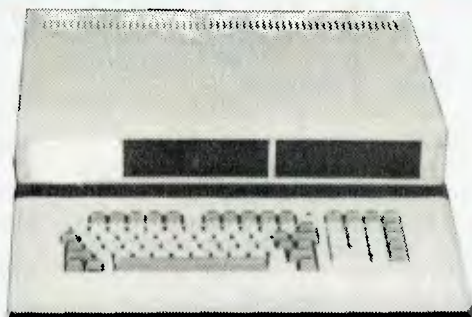
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By Lloyd R Borrett

IN A LAST minute update to the January column, I managed to include details of where to get a catalogue of the forty volumes which currently make up the PC Blue Library. The arrangements for distributing PC/Blue Library volumes have finally been completed.

The catalogue, which contains a table of contents and brief descriptions of the files, is available, postpaid, for \$10.00. The price of each volume is also \$10.00, which includes the disk and copying. Do not send disks in lieu of payment. Add \$5.00 for postage and handling with each order requesting disks. The address for orders is:

PC/Blue Library,
C/- PC Connection Australia,
8/34 Elizabeth Street
Elsternwick 3185.

Make your money order or cheque payable to PC Connection Australia. All orders for catalogues and disks must be prepaid. This is a non-profit distribution service only. No arrangements have been made for handling contributions.

What's available? For full details you will have to obtain the catalogue, but the following list gives a brief summary of the contents of each disk.

PC DOS

- 001 Misc. utilities, Mods to IBM Async Comms support (CP/M-80)
- 002 MicroSoft MBASIC games
- 003 MicroSoft MBASIC programs (mostly games)
- 004 MicroSoft MBASIC
- 005 MicroSoft Trek Programs in MBASIC
- 006 General Ledger, Monstrous Star-trek (MBASIC)
- 007 RATFOR (CP/M)
- 008 Miscellaneous FORTRAN programs
- 009 EBASIC Compiler/Interpreter (CP/M)
- 010 Monstrous EBASIC Startreks
- 011 EBASIC games
- 012 EBASIC programs (mostly games)
- 013 Original Adventure - 350 points (CP/M)
- 014 Bob Van Valzah's "Pascal Pascal Compiler" (CP/M)
- 015 ALGOL-M Compiler/Interpreter and programs (CP/M)
- 016 Miscellaneous utilities EBASIC, MBASIC (CP/M)
- 017 Miscellaneous utilities EBASIC, MBASIC (CP/M)
- 018 Communications package (PC-

- TALK), PACMAN2, and PC Notes
- 019 DataBase package (PC-FILE)
- 020 Remote Bulletin Board System and miscellaneous utilities
- 021 Cross Reference Utility and Front-End Interface Utility (Monitor)
- 022 Expanding Lister Utility for BASIC programs
- 023 Rational BASIC (RATBASE) and miscellaneous utilities
- 024 BASIC games
- 025 BASIC games
- 026 8087 Sampler Programs
- 027 KERMIT - PC/Mainframe Host Communications (1 of 2)
- 028 KERMIT - (2 of 3)
- 029 Miscellaneous BASIC programs
- 030 Miscellaneous Application Systems
- 031 PC-Talk III (supersedes vol 18)
- 032 PC-Talk III Documentation
- 033 Miscellaneous Applications
- 034 dBase and SuperCalc templates
- 035 Miscellaneous BASIC utilities
- 036 IBM Keyboard Drill System
- 037 Modem7/IBM, Program Control System, Wordstar modifications, miscellaneous utilities
- 038 Disk directory utilities, Squish RE-Marks, Lotus 1-2-3 modifications
- 039 Screen editor, Primitive Word Processor, Memo Minder, History Drill, Multiplication Drill
- 040 EPISTAT-Statistical Package, miscellaneous communications utilities.

All programs on volumes two to 17 were extracted from the SIG.M and CPMUG libraries. These programs are supplied with MS-DOS (PC-DOS) file headers, so they can be read by MS-DOS. A few are in Z-80 (or 8080) .COM format.

This library is rapidly growing in size (there are at least five more volumes still on their way to Oz). I shall attempt to keep you informed of the latest developments via this column.

Members of the Melbourne PC Users Group and the IBM-PC S.A. Users Group will be able to obtain PC/Blue volumes from the group's librarian. Other user groups wanting to distribute these volumes to their members should contact PC Connection Australia.

Lotus 1-2-3 User Association

About 60 people attended the first meeting of the Lotus 1-2-3 User Association early in December 1983. The association is Melbourne-based and has been established to provide members with access to expert advice on how to

get the maximum benefit from Lotus 1-2-3.

For further details contact:
Lotus 1-2-3 Users Association,
Box 4720 Spencer Street,
Melbourne 3001.

Intending and existing users of Lotus 1-2-3 should make a point of contacting the association. If the first meeting is anything to go by, future meetings and newsletters should be well worth the subscription fees.

Unprotecting Lotus 1-2-3

From the numerous calls I've received, it appears there is more than one version of Lotus 1-2-3 Release 1A around. The modification I described in the January issue only works on one of these versions, thus making the following modified procedure necessary:

```
B>RENAM_123.EXE_123.OLD
B>A:DEBUG_123.OLD
-U_ABA9? (you should see INT 13 at that address)
-E_ABA9_90_90
-W
Writing 15F00 bytes
-Q
B>RENAM_123.OLD_123.EXE
```

If you don't see INT 13 at address ABA9, then the above patch will not work on your version.

But help has arrived. One of the PC/Blue Volumes I received recently contains a file which describes two Lotus 1-2-3 patches. Apparently the patch already given is for the newer version of Lotus 1-2-3. For the older version you should proceed as follows:

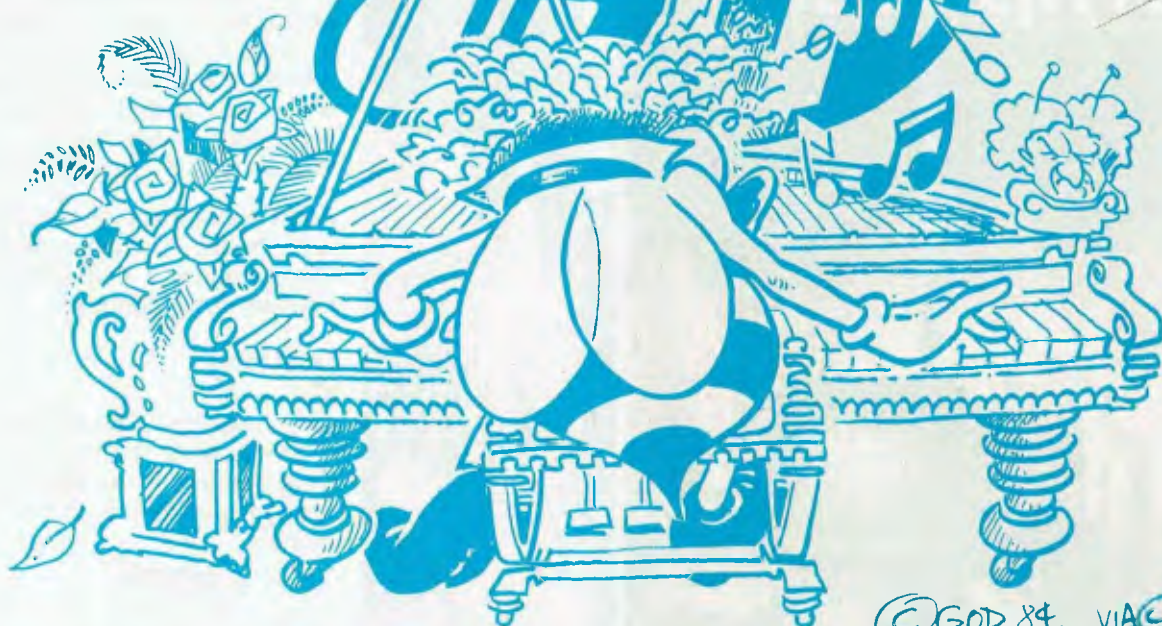
```
RENAM_123.EXE_123.XYZ
DEBUG_123.XYZ
-S DS:100 FFFF EB BE 71
OF40:3666
-E 3666 90 90 90
-W
-Q
RENAM_123.XYZ_123.EXE
```

If that doesn't work you will just have to continue to shuffle system diskettes in and out. I have not been able to test it personally, but this is important enough to publish anyway.

Continued on page 125 ►

Exp. Date... / / Sig.....

Your Microbee As A Composer



Of the literally millions of note combinations that can be played on your Microbee computer, only a few can be classified as 'music'. John Dowdall highlights some of the factors which contribute to the making of music.

DID YOU EVER listen to a small child playing a piano? Painful, it is — music it most resoundingly is not!

The child's attempt to make music would be (technically) one of the worst possible combinations of plain random notes. Try typing program listing 1 into your Bee. When run, it produces random notes, each played for a randomly chosen period of time. While the notes are 'musical', their combination is neither harmonious nor tolerable for more than a few moments.

```
00010 LET A=(RND*20)+1
00020 LET B=(RND*8)+1
00030 PLAY A,B
00040 GOTO 10
```

Program listing 1

Why isn't that music? To find out why, let's look at any melody. Notice how

each note progresses into the next. It's as if the notes themselves have some control over what comes next. That control is usually referred to as 'the rules of music'.

Did you ever wonder just why the rules of music are *the* rules? Or just who decided on this particular set of rules? You did! You and millions of people before you decided by your preferences for what constitutes music and what you would be willing to listen to.

Now I presume that *not all* computer programmers are musicians, but that shouldn't stop us from being able to impress our friends with our compositions. Especially after the trouble Applied Technology took in providing the Bee with musical capabilities.

Random Numbers Make Music

We already know that music is not exactly random, being constrained by musical rules. However, it is possible to generate relatively pleasant sounds using a series of random numbers.

There is a great variety of sources for this randomness; the random numbers provided by your computer represent only one of them. Another would be provided by daily maximum and minimum temperatures. Graph temperatures for a year or two and you will soon see that

the line is cyclic. The random temperatures follow a set of rules conforming to the seasons. 'White noise' — the sound of a TV tuned to an unused channel — is just random sound. Program listing 1 produces 'white music'. If the sounds were to conform to the movements of air molecules we would have 'brown music' (from the Brownian movements of the molecules). Program listing 2 will generate 'brown music'.

```
00010 A=11
00020 B=(RND*7)-3
00030 A=A+B
00040 IF A<0 OR A>24 THEN LET
A=11
00050 PLAY A,2
00060 GOTO20
```

Program listing 2

In 'brown music', each note depends in part on the note before, so in program listing 2, we add a random number (-3 to +3) to the previous note value. You could also try varying the duration using a similar method. But even though 'brown music' is completely different from 'white music', it is still not very pleasing. It simply wanders up and down with no real pattern, and always tends to return to the starting point.

Of course, you could try randomising

variable A every so often, but that won't get you very far either. In fact, much so-called computer music follows similar sets of rules, and quickly becomes boring. An interesting point is that if you photograph a mountain range or a city skyline, and translate the height variations into tone variations, the music produced will be very 'brown'. Other 'brown' examples would include coastlines and tree heights in a forest.

Rhythm And Tonal Qualities

Real music (composed by humans) displays rhythm (so many beats to the bar) and tonal qualities determined by the key. The degree to which you make your music conform to the rules and yet contain originality is the degree to which you may expect praise for your efforts.

In an interesting article in 'Scientific American' (April 1978) Martin Gardiner discusses this topic in some detail, and gives various ways to generate what he calls 'stochastic' music. He also gives details of rather mechanical methods of generating stochastic music.

Music At The Throw Of The Dice

Mr Gardiner also presents in his article a method of combining white and brown music. The combination (called fractal noise) seems to produce a much more musical result.

The method described by Mr Gardiner for producing fractal variations involves the tossing of three dice and adding the total of spots showing. This will produce a random series in the range 3 to 18. There is, however, one rule to adhere to: on the first toss, throw all three. On the next and all subsequent tosses, toss only those which stand for the digits *which will change in a binary number if you add one to it*. The three dice should be of different colours, say red, green and white. Let the white dice stand for the least significant digit, the green for the middle digit and the red for the most significant. The first toss represents zero. Add one. Only the 1.s.d will change — so now toss only the white die. After each toss, add the three dice to get the required note. On the next toss, both the right and the middle digit will change, so toss both green and white. Each time toss only those dice representing the changing digits.

Do you see how the pure random chance of tossing the dice has been modified? In random chance, no number depends on any that preceded it. In our modified version, every note depends in part on up to the last three notes — and the amount of dependence also varies according both to what the previous

number was and to the number of dice tossed.

Having taken care of the notes, let's look at the rhythm. In real music, there is a set number of time periods to the bar. The durations of the notes may vary within the bar, but the total duration is the same from bar to bar (provided we count silences — rests).

In program listing 3, I have, in effect, chosen to use four dice. The DATA in line 200 determines which of the four to toss for each note. The DATA in line 210 represents the 'legal' notes. If you check in your Microbee User's Manual on page 116, you will see that the notes I've chosen are those used in the key of C Major.

Lines 80 to 120 decide which of the dice need to be tossed and lines 30 to 60 actually do the tossing. Line 130 adds the four random numbers and contains code for part of the note selection system.

Lines 132 to 136 set the individual note duration, and then check that against the total duration of the last several notes — allowing a total duration of eight eighth notes per bar. Line 150 makes sure that the program uses all 16 tosses of the dice before starting again. The program ends in line 134.

```
00010 STR$(1000):DIM B(16),F(25):FOR I=1 TO 16
00012 B$(I)="":NEXT I
00014 P=1:FOR I=1 TO 16:READ B$(I):NEXT I
00016 FOR I=0 TO 24:READ F(I):NEXT I
00018 GOTO 70
00020 A=INT(RND*6)+1:RETURN
00040 B=INT(RND*6)+1:RETURN
00050 C=INT(RND*6)+1:RETURN
00060 D=INT(RND*6)+1:RETURN
00070 Q=1
00080 A$=B$(F)
00090 IF SEARCH(A$,"A")=0 THEN GOSUB 30
00100 IF SEARCH(A$,"B")=0 THEN GOSUB 40
00110 IF SEARCH(A$,"C")=0 THEN GOSUB 50
00120 IF SEARCH(A$,"D")=0 THEN GOSUB 60
00130 E=A+B+C+D: IF (E=2 OR E=5 OR E=7 OR E=10 OR E=12 OR
E=14 OR E=17 OR E=19 OR E=22 OR E=24) THEN LET E=R-1
00132 Q=INT(RND*4)+1: IF R=Q THEN LET Q=R-1: IF Q=0 THEN
LET R=0: GOTO 132
00134 IF R=0 THEN LET Q=4:Z=2+1:IF Z=31 THEN END
00136 R=R+Q:IF R>8 THEN LET R=R-8:Q=R
00140 PLAY F$(E),Q
00150 P=P+1:IF P>16 THEN LET P=1:RESTORE
00190 GOTO 80
00200 DATA 'A','D','C','B','A','D','C','B','A','D','C','B','A','D','C','B'
00210 DATA 0,1,1,3,4,4,6,6,8,9,11,11,13,13,15,16,16,
18,18,20,21,21,21,23
```

Program listing 3

After you have run it a few times you will notice that, although each piece sounds reasonably harmonious and different, there is a basic commonality. It seems we may have some way to go before the Bee can replace Beethoven. □

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your ATARI computer

By Ernie Sugrue

WELCOME to the regular Atari column. This column will deal mainly with the Atari home computer, but if you own an Apple, Vic or 64 – don't give up yet. Each month I'll review a couple of programs, discuss any new developments in the Atari network, answer questions (as long as they're simple) and probably just ramble a bit.

Zork I Review

I'm in love with this program. I finally finished it – two months, two nervous breakdowns and twenty treasures after I started it – and I feel it is the best computer adventure ever written. The first in a trilogy of adventures, Zork I is described as being 'Your first step downward to danger', and begins in a field, west of a white house.

Your mission is to discover the twenty treasures of Zork, and escape with them and your life. Sent to stop you are a thief who delights in stealing things you really need, a troll and a kleptomaniac old man. To find the treasures you must first make your way downward, wander through temples and mazes, cross dams and even venture unto the gates of hell.

Zork is unlike any other adventure: it understands complex compound sentences and recognises over 600 words, including some I can't mention here (try them anyway – the responses are quite humorous). With all this to cope with, the program is, not surprisingly, very disk active. However response times are good.

You can save up to five Zork situations on disk, with the ability to start again from that point should you get into a muddle.

Error handling is superb. For example the command, 'Place all but food in' elicits the response, 'Where do you want to put all but the food?' The program also advises you when you have included too many noun clauses, inadvertently missed a noun or verb, or attempted to use multiple objects with certain words (such as 'examine').

The blurb on the back of the pack claims Zork can be completed in 35 to 40 hours ... I'd say it takes more like 90 to 100 hours, but maybe I'm unusually dim.

Included with the disk are an instruction manual, system reference card, and A Guide to the Zork Users' Group which proclaims the availability of clues, maps

and ornately inscribed posters for those adventurers who want a souvenir of completing Zork.

Zork I, II and III, in all popular formats, should be available throughout Australia.

About Adventures

If you are new to computer adventures, or if you'd just like some hints on how to emerge from them victoriously, read on.

What is an adventure? Through the ages the word 'adventure' has conjured up images of danger, life and death situations, good versus evil and so on. Computer adventures let you exercise your adventurous fantasies a little: you can go forth to fight dragons, explore underground empires, venture into outer space, in fact you can do almost anything that may be described in English.

Technically, an adventure is a semi-intelligent, word-recognising program which employs a novelistic approach to present an unsolved puzzle. The game is based on a theme and in a good program the clues, puzzle and any side-tracking adventures should tie into this

theme. You would not, for example, expect to find a digital watch in an adventure set in the reign of Queen Victoria – unless the game dealt with time distortion.

You move through the puzzle by telling the computer in simple language where you want to go. Usually, you may take, drop and manipulate objects which will help you solve the main puzzle. More likely than not there will also be sub-puzzles.

Commands are entered in a two-word verb-noun format (the exception being in Infocom games, where full sentences are allowed). Because some solutions to problems may not at first be obvious, several commands might be necessary to clarify things. A magic lamp, for example, may require the following: 'Turn on lamp' (to see); 'Examine lamp' (there is an inscription on it); 'Read inscription' (the inscription says 'Rub three times and all will be known to you'); 'Rub lamp' (the lamp vibrates slightly); 'Rub lamp' (the lamp glows brightly); 'Rub lamp' (there is an almighty crash as the walls around you tumble inward and you awaken in a strange place) – and so on.

In most adventures, you can save positions on disk or tape and return to that point in the game if things don't go as they should. You generally save your position if you are about to enter an unknown place, or fight an assailant you know you probably won't beat.

Always map an adventure, drawing the room, the exits and the objects in the room. It's easier to do this than be five moves away from a lamp which is going out, and not know whether to go north, south, east or what. Mark each exit clearly and also the direction in which the exit works – reversing your last step may not always get you back to where you were before.

HEELP!! Everyone needs it, so why not ask? Many adventures will give vital clues if you request help or a hint.

Lastly, be sure to examine and manipulate everything you can, because in adventures it's you against them and all may not be what it first seems.

In my next adventure section I'll give you the first steps for writing your own.



Threshold combines high-res graphics, smooth animation and good sound effects.

Threshold Review

Now and then an arcade game comes along that is extremely fast, addictive and difficult to master. Threshold is such

a game, combining high-res graphics, smooth animation and good sound effects. You always seem to find yourself saying, "Just one more game".

Manufactured by Sierra-On-Line in the United States, Threshold was released about 18 months ago and became an instant bestseller.

The idea behind the game is simple and unoriginal: shoot the aliens before they shoot you. The game combines 24 different alien sets, beginning with simple 'bird' shapes and ending with ... well, the tenth set is complicated.

You are allotted five ships and you dock with the mother ship every fourth screen. During this docking, your unused fuel is converted to points, more fuel is supplied and lasers, if overheated, are cooled.

If your lasers overheat (you are warned before they do), you may not shoot until they cool. In the meantime the aliens will not suspend their attempts to destroy you.

You also have a fuel limit (time limit)

within which you must destroy all four screens between dockings. The first docking is easy to achieve, but fuel tends to run out very quickly towards the end of the eighth screen.

You can also choose different settings: slow or fast, moving star or space background. The only objection to the moving star background is that the stars look too much like alien missiles for comfort. Pulling back on the joystick slows the enemies down considerably, allowing you to 'pick 'em off' easily. This advantage, however, lasts only for a short time and may be used only once with each ship.

The game pauses during the docking procedures while the next set of screens is read off the disk. This is a minor delay which shouldn't upset anyone.

The aliens have different characteristics and each one must be learned before the game can be mastered. Some swoop and fire, others just drop on your ship before you can blink an eye. All are deadly.

The author claims the last screen is something special and you'll know when you finally reach it ... I'm afraid I'll have to take his word for it. Threshold is available for Atari 40K machines with disk drive, for about \$45.

Atari Software Dealers

This is a request to the many Atari software dealers out there. I hope to, in the next couple of months, begin the 'Atari Top 10' programs listing. I can't do this without you. Please write to me if you're willing to help compile this list. My address is:

PO Box 594,
MARYBOROUGH 4650.

In the next Atari column I hope to give a short review of the Atari 800XL and a review of Caverns of Mars, the program that made \$500,000 for its 17-year-old creator in only one year.

If you have any comments (good or bad) or suggestions of what to include in this column, write and tell me. ☐

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your TRS80 computer

By Rod Stevenson

A FEW TIMES in the past I've mentioned the Z80 Assembly course I run within the Adelaide Users' Group. I'm pleased to say it continues to be successful. Unfortunately, it seems I've raised a few readers' hopes unjustifiably, in allowing them to think I could offer something along the same lines by mail. While I'd certainly like to repeat the success of the local course, I must say that my method of running it won't work by mail. The major benefits of attending a course such as this are the interaction of participants and the exchange of experiences. Put it down to yet another disadvantage of not living in Adelaide.

Learning Assembly

So, my advice is to read as much as you can from as many different authors as you can access, and eventually you will attain the understanding and way of thinking needed. For that's the reason (as I see it) for the success of my course: I'm not trying to teach facts, just a way of thinking. With BASIC you can do it without the proper way of thinking. With Assembly you cannot get past the total mystery stage unless you're thinking in the right way.

My advice is to read and read and read, before rushing out and spending perhaps hundreds of dollars on the programming tools you will eventually need if you become a devotee of Assembly. After all, it could be that once you've got the total understanding that comes with the way of thinking, you will decide that Assembly language is not for you — nothing wrong with that either, so long as you know what it is you're dismissing. I'm the first to admit that I like Assembly mainly for its tediousness, and just because it's there. I rarely actually have to use it.

In teaching the course I use Hubert Howe's *TRS-80 Assembly Language* as a textbook, but for absolute beginning reading with no guidance I'd suggest Bill Barden's *TRS-80 Assembly Language Programming*. While I believe Howe's is a better book, he does skip lightly over some points. So read Barden first, then for a fuller understanding re-read the same thing in Howe. Yes, I'm aware Barden has published a sequel, *More TRS-80 Assembly Language Programming*, but when you're ready to move on from his first book I consider you'll be better served by Howe.

I hope when you've finished the above two books you'll be well into the

necessary way of thinking. If not, just keep reading as much as you can find along the same lines. Of even greater value, I believe, is a study of the Assembly programs and routines to be found in the specialist TRS magazines from America. And since it is a way of thinking you're trying to pick up, learning about 8080 Assembly programming is just as good if you can't find enough about Z80. Indeed, I got my understanding from a course in 8080, then enlarged my thinking to include the additions provided by Z80.

For those that don't know the history of these programming methods: Z80 followed 8080 when some of the developers left Intel to set up Zilog, and Z80 uses all the 8080 code.

The next necessity is some knowledge of the 700+ Z80 instruction codes. Here I recommend Wadsworth's *Z80 Instruction Handbook*.

Now you can hand-assemble some short code, with reference to tables. To get it into the computer you can use a monitor or POKE it in from BASIC, but that's not a subject to delve into here.

By now you should be able to pick up any Z80 Assembly listing and understand what it's doing. At least it shouldn't still look like a page of misprints! Having reached this stage, you'll need to go out and spend some money on an assembler program. The Microsoft EDTASM+, with which so many of us started, is no longer available. I understand the cheaper of the two assemblers from Molymerx is adequate, but I have no personal knowledge of it, nor do I know if it will work on a System 80 without the modification needed by EDTASM+ to accommodate the timing difference. The reason I limit my course to tape is the many differences in disk operating systems; if you're trying to learn to use an assembler, you won't appreciate problems introduced by the disk operating system. However, if you must use a disk assembler I recommend EDAS; it will work as a simple assembler when that's all you want at the start, and when you're ready to advance it's all there waiting.

I must stress that no assembler manual will teach you Assembly language; it will tell you how to use the assembler it accompanies to write Assembly.

Once you get past the first few simple programs, you'll possibly (?) find your masterpiece doesn't work! Now comes the need for some form of debugging

program, to allow you to single step the program in its running condition, examine the registers as they change, and determine why it's not doing what you intended. There are several debugging programs available, and many people swear by TASMOM from the The Alternate Source. Others hold that the single stepper and associated facilities in MON 5 are best. My choice is DBUG from Micro 80 in Adelaide: you get the program and a ROM reference manual (contains Model 1 and Model 3 material) in a package called the Assembly Language Toolkit. Perhaps I'm biased toward it because I was one of the pre-release testers author Eddy Paay asked for users' criticisms, to bring the program to its current state.

The last requirement on my list is a monitor program. This I consider necessary even if you're not going to write Assembly. I recommend MON 5 from Howe Software for disks, or MON 3 for tape systems. MON 4 is now superseded, so buy it only if it's offered at a considerable discount. As mentioned above, MON 5 has a single stepper, so perhaps you'll fill two functions with this purchase. However, I believe you'll still eventually find the need for a ROM manual.

Yes, the above is an expensive list. But the \$200 or more need not be spent all at once. Just get Bill Barden's book and see if you like Assembly.

Sources

Barden's book may be bought from Tandy. Howe's book is published by Spectrum and available from McGill's, 187 Elizabeth Street, Melbourne. Wadsworth's book is published by Hayden and is also available from various local computer stores, or from the distributor, Micro 80, in Adelaide. MON 3 is in the Molymerx range, but I had to phone Howe Software in America (on (914) 634 1821) to get MON 5 from: 14 Lexington Road, New City, NY10956. Two specialist TRS American magazines, available at most larger bookstalls, are *80 Micro* and *Basic Computing*.

If the above diatribe is all too confusing, just send me a SSAE and I'll give you customised advice to suit your particular interest.

New Model 1?

For some time the Model 1 has been a discontinued Tandy line, and Dick▶

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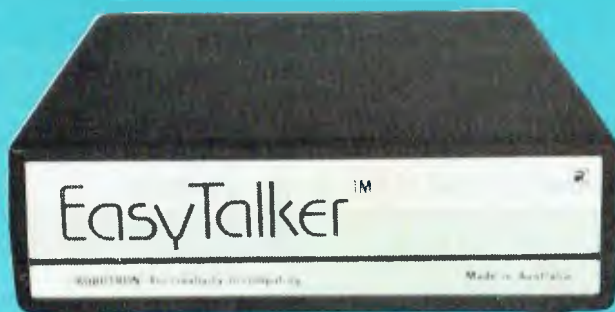
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Smith has also stopped selling the System 80, so the only choice was a second hand unit of either. Now there is the Komtek 1, to fill the gap for those who want a Model 1 'work-a-like'. I haven't tested it personally, but I suspect that as it's not really a Model 1 there will be some incompatibilities. At the time of writing (December) I'd only seen a demonstration of the Komtek 1 at our local users' group and I don't have a list of stockists, but I imagine there will be some advertising forthcoming.

From the brief look I had, it does seem an 'improvement' on the original Model 1: it has the option of colour, and the full use of all available addressable memory. So there's yet another computer to investigate before you spend your money.

Benefits of a Group

I know I must seem to be constantly pushing my own barrow when I point out the unmatched benefits of joining your own local users' group. But what I say must apply, to greater or lesser degrees, to most groups around the country. That is, you'll get to know other people who not only share your own interest in hobby computing, but who share your own specialist interest within the hobby.

Also, if you occasionally need a printer, but don't want to buy one, you can probably locate a few members willing to allow you the use of theirs. For while there isn't the market for a commercial concern to rent out micro-equipment, there is likely to be someone within any group who will oblige. When the time comes to buy, you will also have the benefit of knowing about a range of printers through their owners. The same applies to disk drives or whatever else you might be thinking about.

Youthful Initiative

I recently received a couple of games for review from Nickolas Marentes (19) and Richard Lindley (18) of Fun Division. Not being into the games scene (I certainly don't see anything wrong with playing, it's just that I recognise my fingers are not well enough co-ordinated), I passed them on to Ed Grigonis for review.

Difficult Programs Better

I wonder how often you've started using a newly acquired program (without perhaps bothering to read the documentation), decided it's too hard, and regretted buying it? I know I have fallen into this trap more than once.

Now I've come to realise that programs which are easy to master in the beginning often leave me without enthusiasm after a short time, whereas programs which require effort to understand and conquer usually reward that effort.

Of course, there are exceptions to the rule: EDTASM+ and EDAS come to mind as having been eminently workable without requiring any effort at all. But on the whole, I've become wary of those programs which work to their ultimate the first time.

Printer Filter And Re-route Programs

I recently read a reader's letter in another magazine, asking about a printer filter program and a program to route the printer to the screen. Both these facilities are available in LDOS, and are also obtainable as stand-alone utilities from American software houses which advertise in *80 Micro* and/or *Basic Computing*. Of course, you could write a routine to do it yourself.

Our esteemed editor has mentioned to me that the more thirst for knowledge I manage to quench through this column, the less queries the staff of *Your Computer* has to cope with. So, keep the letters coming because much of what I say here is sparked by your questions.

Utilities

One benefit of being a TRS owner, that some don't seem to appreciate, is the huge array of utilities available to do an enormous number of tasks. This means if you keep checking the advertisements (American specialist magazines are more rewarding in this search), you'll most likely discover one to do that particular task for you.

The professional mainframe programmers have nothing like these facilities, simply because there isn't a big enough market for them. They have to do most of it themselves. I've noticed a few of my acquaintances from this field are transferring their talents to the micro scene — they claim it's rewarding in a job satisfaction sense, quite apart from any monetary reward!

System 80 Support

Yet another reason to join your local users' group is that since Dick's no longer selling the System 80, I hear that he (understandably) is not supporting it either (apart from still offering paid service for faulty units). In a users' group

you'll find other owners can help you with all sorts of things, from parts to programs.

Tape Recorder Compatibility

In the belief that owners of other brands of computer read these pages, I'd like to pass on that the Tandy CTR80 and 80a have been found suitable for reliable program saving with other than TRS equipment.

The Tandy policy of refunding your money if a piece of equipment is returned within seven days takes the risk out of buying. It doesn't mean that there has to be a fault, just that you want to return the item — with the common sense proviso of your having kept the docket and the equipment being undamaged. This policy is printed on the bottom of the normal Tandy docket for all to see.

So don't accept the need for multiple tries before you get a good recording — try a CTR 80a. It's not the cheapest available, but in this case I don't consider price to be the all-important factor. □

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NO SOONER HAD I set my computer systems up again than the editor was on my back about the deadline for this issue. Now as my computers have been stored for the last month or so, I have been taking a holiday from computers, so my usual ploy of "writing about what I have been doing with computers" isn't going to work for this column. After racking my brains for a while, I thought that I should still write about what I'd been doing and tell you about how I got set up for the move of my computers from Sydney to Brisbane.

Though moving long distances isn't anywhere near as common in Australian society as it is in the USA (where nearly everyone that I have ever met seems to have moved from somewhere a long way off), it is becoming more common in high technology industries here. So, I'm offering some advice on how best to make sure your computer system survives the removal to a new address.

Software

As always with computers, there are two aspects to consider — the software and the hardware. With software, *hand carry it with you whenever you move, if at all possible*. No matter how careful you instruct others to be with your precious magnetic media, they will never treat it as carefully as you would. In my case I had several hundred floppy disks to move. As I only had the opportunity to take one station wagon load of stuff from Sydney to Brisbane myself (which had to mostly be essential household items and clothing), I had to entrust most of my software to the removalists. As most of the material was public domain software and is effectively backed up at multiple sites around the country, it was fairly safe to trust that to the removalists. I finally elected to hand carry my most important commercial 'original' disks, my hard disk back-up set and my daily work disks. This amounted to six plastic storage boxes, which I managed to squeeze between the other things in the back of the station wagon.

I figured that if any of the less important commercial 'original' disks got magnetically damaged, I would probably be able to get them replaced, provided the disk with the original printed label was physically intact. The daily work disks were the crucial items as they had original material that I had created and that only my efforts could replace.

In most cases I have backups for nearly everything, so I organised for the

backups and 'originals' that were going with the removalists to be put in separate packages, to minimise the risk of both sets getting magnetically zapped or physically damaged. For a long time now I have kept my disks in steel floppy disk filing cabinets (made by CSM and Davell), so all I had to do was lock the cabinets up and get the removalists to pack them in cardboard boxes. The steel cabinets were a good precaution against damage in themselves. I did make one mistake, however: instead of keeping one set of keys with me, I sent the lot with the removalists who promptly lost them! The locks were all tumbler combination numbered, so I was able to get replacement keys from a locksmith (at a cost of \$42, those little keys aren't cheap) — but it was a nuisance.

A few disks did get packed in just the normal hard-plastic disk cases, and I'm pleased to report that a random sampling of both the disks shipped in plastic and those shipped in the steel cabinets has shown that all seem to have arrived without damage.

Hardware

Because of time constraints, we had to get the removalists to do the packaging for us, so I made sure they understood that computer equipment was delicate and would need special packaging. In the end they came prepared with a lot of packaging material and took particular care with packing all the electronic equipment (stereo, TV and so on), as well as the computers. It is worth your while making sure they understand that special care is needed.

It was a great temptation to go on using the computers right up until the last moment (especially as I was running late on the deadline for my previous column), but I decided I should pre-pack as much of the computer equipment as possible. This basically involved: disconnecting all the cables and neatly fastening them in coils; securing all covers tightly with their original screws and fasteners; taking all the disks out of the floppy drives and replacing them with cardboard 'transport disks' (you know, those funny bits of cardboard that come inside the drives of a new computer ... the ones you tossed straight in the rubbish bin); locking the heads on the hard disk; getting all the loose fanfold paper into boxes of some sort; putting dust covers on equipment; and generally trying to stack it up in such a way that if there were two or

more of any item, they wouldn't get packed in the same box.

I gave the removalists clear instructions that all boxes containing computer equipment were to be clearly marked as such, to make unpacking easier.

All the computer hardware has arrived intact, though I haven't had time to fire up the hard disk yet. The precautions that I took in packaging the equipment certainly helped. I didn't take any precautions in prepacking the stereo equipment (though the removalists packed it as securely as the computers) and it did suffer some minor damage in transit.

Beware

One piece of computer equipment did suffer some damage in transit and thereby hangs a cautionary tale. The item in question was a spare disk drive enclosure, which ended up being packed in a sort of 'leftovers' carton with some other odd pieces of non-computer electronic equipment.

The information we received from the removal company before the move contained a list of items that they wouldn't transport. It included most chemicals and corrosive agents. As we were getting the removalists to do all the packing for us, we naturally assumed that their packer wouldn't pack anything they had described as dangerous. *Wrong!* He packed a bottle of "Organic Cement Cleaner" (just the thing for getting grease stains off the driveway), and it leaked over three cartons. This horrible stuff seems to have a particular affinity for paper, so the cardboard cartons took the brunt of the damage, but we ended up with some fatally stained 'stainless' steel and damaged electronic equipment. Only a very little found its way through to the drive enclosure and it lifted a little paint, but the box cleaned up OK. A command control system was severely damaged and I shudder to think what might have happened had a box of computer equipment been in the way of the leaking cleaner!

We had insurance to properly cover the cost of replacing the computer equipment, but it still would have taken some time to replace everything. In comparing notes with others who have moved, it seems we were fortunate, since apart from a few damaged items everything else arrived intact (including a lot of delicate crystal glassware) and on time.

Again?

If I ever had to move computer equipment using removalists again, I would wrap all the computer equipment in heavy duty plastic and seal it as far as possible. I'd probably try to hire a plastic file heat sealing system, and heat seal everything in big plastic bags.

DRI And UNIX

Digital Research has been commissioned by Intel to port UNIX System V to the Intel iAPX-286 (80286) processor. Western Electric, the UNIX copyright owner, will retain full rights to the product with DRI and Intel having the non-exclusive right to market object code versions. Originally, Intel wanted Microsoft to do the port to the iAPX-286, but for some reason Microsoft was unable to handle it.

CP/M Z80 On A Chip

Zilog Corp and AMI are working on a new chip that will embed CP/M in a single-chip, integrated operating system processor, based on Zilog's Z80 processor. AMI is doing the design work in conjunction with DRI.

This removeable CP/M is called 'Personal CP/M' and is an enhanced CP/M version of 2.2, rather than CP/M Plus. This is obviously a move to gather business in the portable computer area, where many of the new machines such as the NEC 8200 are using RAM for removeable storage rather than traditional disk systems. The US military requires at least two manufacturing sources of any IC product before it will use the product in military computer systems. With both AMI and Zilog producing the chip, there is an obvious expectation of military applications. Now lets see, just as the ICBM is about to lock onto target we BDOS error on ...

CCP/M Version 3

Version 3 of Concurrent CP/M-86 replaces MP/M-86 in the DRI product range. This latest version of CCP/M can be configured by the system implementer as a single user, multi-tasking system (like the previous releases of CCP/M-86) or as a concurrent multi-user, multi-tasking system (Concurrent MP/M-86, in effect).

In addition, PC DOS emulation for DOS 1.1 is supported, allowing multi-tasking PC DOS with a real-time nucleus. Window support (for DRI's windowing scheme) is also provided, together with support for multiple GSX

applications running concurrently.

Some important features of CCP/M-86 Version 3.1 are:

- * In conjunction with DR Soft/Net, clusters of independent machines may be linked together to share equipment or information.

- * When using the 8087 co-processor, the 8087 registers are only preserved if the next task needs to use the 8087. As the 8087 is 80 bits wide, saving its registers can eat quite a slice of time, so there no point in doing it if you don't need to.

- * Shared code support allows the code segment of programs written with separate code and data segments to be shared. This means lower memory usage and a reduction in the program load time. This is particularly important in multi-user environments where several users may be executing the same program.

- * Enhanced PRINT utility.

I expect the first commercial implementations of CCP/M-86 V3.1 should start to appear around April or May, 1984.

CBE Technology For FORTRAN 77

Digital Research is moving towards using a Common Back End (CBE) technology with all its compiler languages. The first product to use the CBE will be the new FORTRAN 77 for 8086. The Fortran 'Front End' emits a Common Intermediate Language (CIL), which then couples to the code generator for the target processor. Working together, the 'Front End' and CBE produce native code for the target processor.

The new CBE technology means that each time a new CPU or operating environment is targeted, DRI only needs to generate one 'Back End' and one runtime for all its language 'Front Ends' which produce CIL; whether it's DR FORTRAN-77 (at first), or PAAL/MT, DR C, CBASIC or PL/I. For the FORTRAN-77, both the 'Front End' and CBE are written in DR C. This eventually will provide source code portability across 8086, 80286 and 68000 processors, and across CP/M-86, CCP/M-86, CP/M-68K, PC DOS, MSDOS and UNIX operating systems.

DR FORTRAN 77 meets the full ANSI FORTRAN 77 standards. It also provides automatic 8087 support, 40-character variable names and arrays of up to 64K elements. It will interface with Ac-

cess Manager, Display Manager and GSX.

DR Soft/Net

DR Soft/Net features file sharing, password protection and record/file locking. CP/M applications running under DR Soft/Net operate as they would on a stand-alone system. In conjunction with CCP/M, DR Soft/Net provides a file server capability at each station on the network. The multi-tasking capabilities of DR Soft/Net let each user share files, transfer information and perform other tasks while running an application. Its multi-tasking capabilities also support transferring data between local and remote processors via LAN, thus providing full distributed processing. A separate work-station CPU is not needed to supervise networking.

DR Soft/Net adheres to the guidelines on modular layering at the 'session' and 'transport' levels established by the ISO.

PAMS News

As I write this in early January, Telecom have just received my application for a telephone line for the RCPM. They told me it will take about "three to four weeks" to get the service installed, so by the time you read this, the Software Tools RCPM should be back on-line again in Brisbane. Look for details of the number on the other RCPM systems (or, if you are really desperate, I guess you could try calling the *Your Computer* office because they will know as soon as it's connected).

I expect there should be another system on-line in Sydney soon and possibly a second system in Brisbane, too. □

PAMS Numbers

Mi Computer Club BBS (MiCC-BBS): (02) 662-1686 24 hours
Micro Design Lab RCPM (MDL-RCPM): (02) 663-0151 24 hours
Sydney Public Access RCPM (SPA-RCPM): (02) 808-3536 24 hours
Melbourne CBBS (MICOM-CBBS): (03) 762-5088 24 hours
Software Tools RCPM (ST-RCPM): (07) 378 9530 24 hours.
Sorcerer CBBS (SUGA-CBBS): (03) 836-4616 24 hours
Gippsland RCPM (GL-RCPM): (051) 34-1563 24 hours
Perth RMPM (WA-RMPM): (09) 381-6070 6pm-9pm WST.

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your HITACHI computer

By Dom Swinkels

THIS MONTH we take a closer look at the Success, or the Hitachi MB-16001 as it is formally identified. I borrowed a machine from Computer Innovation Group in North Sydney. Computer Innovation distributes the Success and the MB-6890 (Peach), as well as several related disk drives, printers and so on.

MB-16001 Operating System

The unit tested contained two 320K floppy disks and the operating system was MS-DOS. When switched on, the machine loads MS-DOS from the disk in drive A. If the machine has its three AA batteries inserted to maintain the clock and other backup information, the correct date and time are displayed and some copyright messages, together with the MS-DOS prompt, appear on the screen. The MS-DOS prompt consists of the letter of the current disk drive (initially, always the boot drive - A) and ">".

This prompt indicates that a program called COMMAND.COM has been loaded and is running. The program monitors the keyboard and accepts about 20 different commands. These commands allow the display and setting of the time and date; formatting and copying of disks; typing, erasing, renaming or copying of files; and other house-keeping operations. The DIR(ectory) command produces a list of all the files on the disk in the current drive. File names have up to eight characters in the name and up to three characters in the extension, in the form NNNNNNNN.EEE. Although any extension can be used, some conventions are expected by the system:

- .COM for command files
- .BAS for BASIC program files
- .BAT for batch files
- .DAT for data files

COM files may be run from MS-DOS in the command mode by entering only the name (for example, CHKDSK). The nominated .COM program is then loaded and run. Thus, CHKDSK will produce a summary of the number of files and the amount of free space available on the current disk, together with a statement of how much RAM is available.

If you want a hard copy of the screen at any time, simply press SHIFT and COPY and all the text on the screen is dumped to the printer. Early versions of the DOS did not implement the graphics

screen dump (GRAPH + COPY), but more recent versions do work provided you have a suitable printer. When in doubt, ask your dealer to demonstrate before buying.

Some of the ten function keys along the top of the keyboard are used to good effect under MS-DOS, to control the editing of the command line. This is particularly useful when using the line editor. To edit an existing file type EDLIN <filename>. This loads and runs EDLIN and if <filename> exists on the current disk it gets as much of <filename> as will fit conveniently in memory. You can then perform all the usual editing functions on a line by line basis: such as listing lines to the screen, deleting or inserting lines, searching for strings to edit them or searching and replacing with another string. When you are finished, the E(nd) command will save the edited file with the same name, while an unedited version will have been created with the extension .BAK.

A useful file to create using EDLIN is AUTOEXEC.BAT, since MS-DOS looks for this file at boot up. If such a file exists, the commands it contains are executed sequentially. You might, for example, create the following AUTOEXEC.BAT file:

*INSERT1

The only problem with an AUTOEXEC file is that whenever you return to MS-DOS (for example, from BASIC), the system will look for the next command in the AUTOEXEC file. If, in the mean time, you have changed the diskette in Drive A, then you may have a different AUTOEXEC file on it, or no AUTOEXEC file at all. In the latter case an error mes-

sage will appear, asking for the disk with the AUTOEXEC file to be put back in.

Other utilities available from the command level are:

*INSERT2

The BASIC interpreter is loaded from the command mode, like any other program, by simply entering its name. Note that any of the names used may be changed, so, if you want to confuse a casual user of your system, you could change the name of the BASIC interpreter from BASIC to FORTRAN or anything else which appeals to you.

Whitethorn PROMs for the MB-6890

Whitethorn Software has produced several PROMs, designed to fit into the empty socket of the Hitachi MB-6890 machine. In the memory span of the machine, this fits into the range &H8000 to &H9FFF, a range which is vacant if you have the minimum configuration computer. If you have added a RAM card it will be occupying this range and it must be of the bank selectable type to be able to select the ROM if both are fitted.

With one of the Whitethorn PROMs, the minimum MB-6890 configuration with a colour monitor becomes an intelligent colour terminal to a remote computer. Although I was not able to test the full capabilities of the PROM in the terminal mode, I did test some of its other features, such as enhanced monitor capabilities and some new BASIC commands.

These new commands are: VDU (terminal mode, using the new PROM); DUMP (dumps the current text screen to

*INSERT1	File	Effect
	B:	changes to B-drive as the current drive
	CHKDSK	displays No. of files and free space on B-disk
	DIR *.BAS	list all .BAS files on the screen
	BASIC WORLDMAP	loads BASIC interpreter and runs the file WORLDMAP.BAS
	CHKDSK	runs CheckDisk program again on return to MS-DOS from BASIC.
*INSERT2		
	DISKCOMP	compares two disks. This is useful for verifying a disk after making a copy.
	FILCOM	compares two files.
	EXE2BIN	converts a relocatable object file (.EXE) to an absolute binary file (.BIN)
	MODE	sets the mode of operation of the screen, printer, type of disk drives, RS-232C communication mode etc.
	DEBUG	for debugging machine language programs.
	LINK	for linking together separate modules of object code.
	MS-LIB	for creating and editing modules of object code.
	BASIC	the BASIC interpreter program.

the printer); CODES (similar to VDU, but prints control codes received as HEX numbers in reverse video); and LER-ROR(logs transmission errors during terminal operation and prints them at the end of a session). The DUMP command is similar to the screen dump routine given in this column in the August 1982 issue of *Your Computer*, but since it is written in machine language it's a good deal faster and limited only by the speed of your printer.

In terminal operation some of the features available include, setting the scroll window and the PF-keys from the host computer, sending machine language programs to and from the host, simultaneous output to the screen and parallel printer, and changing character and background colours.

New monitor commands are T (to transfer the contents of a memory range to another area in memory) and W (to write a specified value to a range of memory). The D command, which displays a range of memory, has been improved and now gives a display of sixteen lines by sixteen locations, in both

hexadecimal and ASCII equivalents. This is similar to the MEMLOOK1 routine in the November 1982 issue of *Your Computer*, but much faster.

This PROM clearly provides many useful facilities, particularly if you have a direct line to a larger computer. However, the PROM does not cater for the normal telephone acoustic coupler, as the 300 baud rate is not normally supported. This can be changed on request. The terminal emulation PROMs are sold through Direct Data, P.O. Box 241, Armadale 3143. Phone: (03) 20 6949. The retail price is \$150.00 and Peter Koadlow of Direct Data can provide further details.

A PROM containing just the monitor enhancements is available for \$25.00 and the same program on disk may also be available soon.

MB-6890 Disk Utilities

The Hitachi MB-6890 Disk Basic software comes with a few necessary commands to access disk information directly; such as FILES"d:", DSKF(d), DKS\$(d,t,s), and DSKO\$(d,t,s) - where

d, t and s stand for drive, track and sector, respectively. The last two commands are particularly useful if you want to get involved in the details of disk storage, beyond simply using the disk as a medium for storing files. The sort of thing you might want to do is to get a map of where your files are stored on the disk; or to look at files and modify them as they are stored on disk, rather than reading the entire file into memory, changing it and writing it to disk again. Moving files or DOS from one disk to another, or sorting the directory into alphabetical order also becomes possible. I have written several such utilities for both single and double density disks and translated some of the Japanese utilities.

One of these utilities is given in Listing 1. It produces a map of a single density disk on the screen, with the facility to dump the screen to your printer, allowing you to keep the map with the disk. The map shows where each file is stored on the disk. Anyone interested in details of the other utilities, please send a stamped, self addressed envelope to

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The Concept

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The Sierra multi-user system is available in several forms. The desk top version shown can be configured with either two 8" floppy drives or one 8" floppy drive and a hard disk. Up to five users can be supported. Other versions can maintain up to 16 users. Hard disks are available in various sizes.

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Another two disk utilities are available from Modular Computer Systems and I received a copy for review from Andrew Hassell some time ago. The single density version is called DISCZAP and the double density version is DDZAP. The DISCZAP program consists of a long BASIC program (over 600 lines) and a group of machine language routines called by the main program for speed. The features available are easily seen from the main menu:

A...DISPLAY /MODIFY DISK SECTORS

B...SECTOR SEARCH

C...SECTOR COPY

D...SECTOR EXCHANGE

E...SECTOR FILL

F...DISPLAY/MODIFY FILE SECTORS

G...DIRECTORY

H...MACHINE CODE FILE ATTRIBUTES

I...ZERO UNUSED DIRECTORY ENTRIES

J...ZERO UNUSED GROUPS

K...CREATE BASIC DOS DISK

The single density version comes with a 20-page manual which gives general background information about the way disk files are stored and identified, as well as detailed instructions on how to use each of the features.

If you select A from the main menu, you are put into the display-paging mode for disk sectors. In this mode you are prompted to give the drive, track and sector number on which you wish to work. The required sector then appears on the screen in both hexadecimal and alphanumeric mode. To display other sectors you use the cursor arrow keys to move sectors left or right on the same track, or to move to the same sector on the next or the previous track. This is where the machine language routines used come into their own. The program is a fast and convenient way to search manually for a particular sector. You can, at this stage, select to go to the modify mode and change any byte(s) in either the hexadecimal or the alphanumeric part of the display. While in this mode <SHIFT><GRAPH> prints the screen display on the printer.

The other main menu choices allow you to search the disk sector by sector for a given string, copy sectors from one disk to another or from one part of the disk to another part of the same disk and so on. Option F does the same as

option A, except that it automatically finds the sectors belonging to the file of interest, which may be scattered over several tracks (particularly if the file has been modified a few times since it was originally written to disk).

Options I and J are used to clean up disks which have been in use for a while and have the remnants of KILLED files on them.

All in all the DISCZAP utility is fast and convenient to use. It is well documented and is available on a copy-protected disk from Modular Computer Systems, 10 Cosdown Close, Tullamarine 3043. It costs \$75 (including sales tax). The double density version is called DDZAP and only has the facilities under A above. It sells for \$45.

Listing 1. Program to produce a map of a single density disk.

```

10 REM .... "DISKMAP"
20 IF PEEK(584) < 15 THEN NEWON 15
30 CLEAR 3000: DIM FILNAME$(40), FSTART(40)
40 CLS: CONSOLE 0, 25: PRINT " * * DISKMAP UTILITY * * ": PRINT
50 INPUT "MAP OF WHICH DRIVE ? ", D
60 REM... READ AND ANALYSE DIRECTORY TRACK.
70 FOR S=7 TO 16
80 B$=DSKI$(D, 20, S)
90 FDIR$=MID$(B$, 32*B+1, 32)
100 A=ASC(FDIR$): IF A=0 OR A=255 THEN 130
110 N=N+1: FILNAME$(N)=LEFT$(FDIR$, 8)
120 FSTART(N)=ASC(MID$(FDIR$, 15, 1))
130 B=B+1: IF B<4 THEN GOTO 90 ELSE B=0: NEXT S
140 REM... PRINT MAP OUTLINE AND LEGEND.
150 CLS: COLOR 12
160 PRINT "      TRACK  111111111222222222233333333333 "
170 PRINT " 0123456789012345678901234567890123456789 "
180 PRINT " 1 "
190 PRINT "S2 "
200 PRINT "E3 "
210 PRINT "C4 "
220 PRINT "T5 "
230 PRINT "O6 "
240 PRINT "R7 "
250 PRINT " 8 "
260 PRINT " 9 "
270 PRINT "10 "
280 PRINT "11 "
290 PRINT "12 "
300 PRINT "13 "
310 PRINT "14 "
320 PRINT "15 "
330 PRINT "16 "
340 PRINT "      TRACK  111111111222222222233333333333 "
350 PRINT " 0123456789012345678901234567890123456789 "
360 COLOR 7: FOR Z=2 TO 17: LOCATE 2, Z: PRINT SPACE$(40): NEXT Z
370 COLOR 2: FOR Z=2 TO 17: LOCATE 22, Z: PRINT " ": NEXT Z
380 LOCATE 0, 21: PRINT " * * : COLOR 6: PRINT " - DISK BASIC ";
390 LOCATE 26, 21: COLOR 2: PRINT " * * ";
400 COLOR 6: PRINT " - DIRECTORY TRACK "
410 PRINT "<BLANK> - SECTOR UNUSED. " : COLOR 2
420 REM... GET FILE ALLOCATION TABLE.
430 IN1$=DSKI$(D, 20, 1)
440 IN2$=DSKI$(D, 20, 2)
450 FAT$=RIGHT$(IN1$, 123)+LEFT$(IN2$, 37)
460 IF LEFT$(FAT$, 1) <> CHR$(254) THEN 480
470 FOR A=2 TO 4: FOR B=2 TO 17: LOCATE A, B: PRINT " ": NEXT B: NEXT A
480 REM... LIST FILES AND FILL MAP IN.
490 COLOR 6: FCODE$="A": X=48: Y=0
500 FOR J=1 TO N
510 LOCATE X, Y: PRINT FCODE$: " - "; FILNAME$(J);
520 BLOCK=FSTART(J)
530 T=ASC(MID$(FAT$, BLOCK+1, 1))
540 TRACK=BLOCK\4: SECTOR=(BLOCK/4-BLOCK\4)*16)+1
550 IF TRACK>20 THEN TRACK=TRACK+1
560 IF T>191 AND T<196 THEN USED=T-191: GOSUB 660: GOTO 590
570 USED=4: GOSUB 660
580 BLOCK=T: GOTO 530
590 Y=Y+1: FCODE$=CHR$(ASC(FCODE$)+1)
600 IF Y=20 THEN FCODE$="A": X=X+6: Y=0
610 NEXT J
620 LOCATE 26, 22: COLOR 4: INPUT "DUMP THIS MAP TO PRINTER (Y/N) "; A$
630 COLOR 7: IF INSTR("Yy", LEFT$(A$, 1)) THEN GOSUB 710
640 LOCATE 0, 22: END
650 REM... MARK USED SECTORS.
660 FOR Z=1 TO USED
670 LOCATE TRACK+2, SECTOR+Z: PRINT FCODE$;
680 NEXT Z
690 RETURN
700 REM... DUMP SCREEN TO PRINTER.
710 OPEN "O", 1#, "LPT0": PRINT #1, CHR$(13)
720 FOR X=1024 TO 3023
730 A=PEEK(X): IF A<22 OR A>159 THEN A=32
740 PRINT #1, CHR$(A): NEXT X: CLOSE: RETURN

```


your KAYPRO computer

By Jeff Richards

A KAYPRO USER GROUP is starting in New South Wales. If the initial enthusiasm is any guide, by the time you read this it will be well and truly up and running. The contact is Harry Richards, 4/2 Bortfield Drive, Chiswick, NSW 2046. Phone: (02) 713 1585.

Direct Screen Addressing

From correspondence I've received it's clear that there is some confusion on how to use direct screen addressing on the Kaypro. The technique is similar to that used on many stand-alone terminals, but it is very different to the technique often found on smaller personal computers.

The screen positions are identified by a row number (0 to 23 from top to bottom) and a column number (0 to 79 from left to right). To position the cursor at a nominated row and column, a sequence of characters is printed that contains row and column number information.

This sequence consists of four characters. The first is ASCII ESCAPE, which is 1Bh or 27 decimal. The second is ASCII "=", which is 3Dh or 61 decimal. The third is the ASCII equivalent of the row number plus 32 decimal, and the last is the ASCII equivalent of the column number plus 32 decimal.

The BASIC built-in function, CHR\$, is used to represent ASCII characters. This function returns a 1-byte string which is the character corresponding to the numeric argument. For ASCII characters less than 32 decimal (such as ESCAPE), the only way to represent them in the program is by the CHR\$ function. Other ASCII characters can be represented either by the character itself ("=") or by the CHR\$ function ("CHR\$(61)").

Therefore, to position the cursor at the top left of the screen (row 0, column 0) we would send the four-byte string consisting of the ASCII characters for 27,

61, 32 and 32. This could be represented in the program in a number of ways. In this example we will assume that the required row and column numbers are variables, and will be passed to the actual printing function in variables ROW and COL.

Stopping BASIC Interference

Before printing the cursor positioning string, a couple of points need to be considered. Unless specifically told not to, BASIC will always finish a print instruction by sending a carriage return and line feed combination to the screen. If we are trying to carefully position the cursor these extra characters will ruin all the hard work. It is therefore essential that the print command sending the cursor positioning string ends with ";" – this tells BASIC not to send the carriage return and line feed, and leaves the cursor right where we have positioned it.

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Similarly, we must ensure that BASIC does not send any other characters in the middle of the cursor positioning sequence. If the characters are sent individually, BASIC inserts spaces between them to space them out across the screen. To defeat this mechanism the characters in the print string should be separated with semi-colons (";") rather than the usual commas.

One other precaution may also have to be taken. BASIC-80 assumes that your screen is 72 characters wide, and will automatically insert a carriage return and line feed every 72nd character, if you have not done so yourself. If you do a lot of cursor positioning, for instance to build a screen format, then you may print more than 72 characters without doing a carriage return. In this case BASIC-80 will insert a carriage return right in the middle of your cursor positioning sequence, causing a few garbage characters to appear. This automatic carriage return should be turned off with the command WIDTH 255. This requirement does not apply to S-BASIC.

The actual command to position the cursor at the row number in variable "row", and the column number in variable "col" is: PRINT CHR\$(27); "=" ; CHR\$(32+row); CHR\$(32+col).

If you want to put a message on the screen at this point, simply attach the message string to the end of the PRINT statement. If you want to obtain input from the operator at a particular position, use the PRINT command as detailed above, followed by an ordinary INPUT command.

When inputting information using cursor positioning it is often useful to clear the remainder of the line once the cursor is positioned; for instance, to remove an erroneous operator response. To do this the code for "clear to end of line" can be appended to the cursor positioning string. Just add "CHR\$(24);" to the above print line. Alternatively, you may wish to clear all the screen below the cursor position, to get rid of an error message for example. In this case use "CHR\$(23);" instead.

To clear a part of a line use the STRING\$ function. For instance, the command PRINT CHR\$(27); "=" ; CHR\$(32+ROW); CHR\$(32+COL); STRING\$(10,32); STRING\$(10,8); will move the cursor to (row,col), print ten spaces, then ten backspaces, and leave the cursor at (row,col).

Clearing The Screen

Another useful screen control command is to clear the screen. Simply printing CHR\$(26); will erase the whole screen and leave the cursor sitting at the top left. The home cursor command (CHR\$(30);) can be used to quickly get the cursor to the top left position without clearing the screen. This can be handy if you want to write software that is compatible with other systems: the cursor can be positioned using the home cursor command and line feeds. As all systems respond to a line feed in the same way, the only adjustment that might be needed for a different system would be the home cursor command.

The command sequences to access special characters are similar to the cursor positioning sequences. In this case, the character stream consists of ESC (27) followed by "G" (71), to turn special characters on, or "A" (65), to turn them off. After an ESCAPE G has been issued, characters between 60h (') and 7Fh will be displayed as the special character equivalent until the sequence ESCAPE A is sent.

The commands to move the cursor left, right, up and down are 08h, 0Ch, 0Bh and 0Ah respectively, but they are not used frequently - direct cursor addressing is usually more convenient than attempting to move the cursor relative to its present position.

Insert And Delete Line Commands

One useful set of commands is Insert Line and Delete Line. These would not be used in normal BASIC programs, but if they can be patched into the appropriate commands of a word processor, they make a significant contribution to the speed of screen updating. WordStar has provision for patching these codes in. The sequences are 1Bh,45h for insert line and 1Bh,52h for delete line.

The other command is Bell. This character (7) will cause the keyboard to sound a bell. The keyboard also responds directly to characters sent to its output port (port 5). The command OUT 5,8 will disable the keyboard beeper, while OUT 5,0 will enable it again. OUT 5,2 will produce a short beep from the keyboard and OUT 5,4 will produce a long beep, while OUT 5,16 causes the keyboard to send a single character. The reason for this is unclear, but it could be used as some sort of keyboard identification.

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your VIC 20/C64 computer

By Andrew Farrell

THE EXECUTIVE 64 is now available across Australia and should prove to be very popular among businessmen. The machine has all the features of our familiar Commodore 64, minus the cassette port and UHF modulator.

Each unit comes complete with a built-in single disk drive and 13 cm colour monitor, for around \$1899. The keyboard is a low-profile detachable type with electronic shift lock and the usual four function keys.

An entire SX-64 weighs only 12.5 kg, and is about the same size as a briefcase. All existing software and peripherals are compatible with the SX, allowing the use of a full-size monitor, printer, game cartridges and disk-based programs.

The screen is easy to read despite its size, and sound reproduction is of high quality. My first impressions of the SX were very good and there appear to be no problems with it.

1526 ... The Saga Continues!

The 1526 is now 'back in stock' at Commodore and dealers grabbed early supplies. The \$64,000 question is does it work with the programs it didn't work with before?

That is a touchy subject in some places, but, unofficially, the only difference I could find was that the problems in powering up with a disk drive no longer exist. (In other words, yes, it still has problems.)

But never fear, for it is now possible to purchase an MX-80 clone, plus matching centronics interface, for about the same cost as the 1526. The MX-80 also has several extra features such as high-res graphics and more print modes.

Zork Tips

Since I first mentioned that I had a copy of Zork kicking around, I've received countless letters and phone calls asking for help and giving advice. Thanks to all those people for their interest. I eventually managed to pass the timber room ...

Several readers also sent in some interesting tips. Don't despair if yours does not appear immediately. There is a large time lag involved between when they are first received and when they eventually get removed from the 'In' tray.

Neil Smith of Western Australia wrote in with some interesting tips for the VIC

20. The first is a simple program to allow the use of function key number one. The program works on an unexpanded VIC and a VIC with 3K.

```
5 POKE 55,191:POKE56,29
10 FORI=7615 TO 7645:READA:POKEI,A
20 NEXTI:POKE788,191:POKE789,29
30 NEW
40 DATA 165,197,201,39,240,3
50 DATA 76,191,234,169,76,141
60 DATA 119,2,169,201,141,120
70 DATA 2,169,3,141,121,2
80 DATA 169,3,133,198,76,191,234
```

The program assigns the list command to function one, however, it occasionally hangs up. To rectify this type: POKE 787,29. Be sure to save the program before you run it.

The following pokes allow two programs to be merged:

POKE 43, PEEK(45)-2: POKE44, PEEK(46)

Then LOAD the second program and type:

POKE 43,1: POKE 44,16
or, for 3K expansion, change the 16 to a 4.

Books

There must be close to several dozen books available covering the VIC 20 and Commodore 64, all of which seem to cover similar topics. The tricky bits of info you've always wanted to know are never usually there - such as how to get sixteen sprites on the screen.

Commodore 64 Exposed does cover some of the more interesting topics in depth, and is also a handy alternative to the reference manual. Another book, *Your Commodore 64*, is good for learning about music and has comprehensive charts and reference information on the sound registers.

Text Files

Often it is useful to transfer a text file to a program and vice versa, especially for editing by a word processor. Another interesting application would be in a program which could actually generate other programs.

Both text files and program files may be written and read in a similar fashion, allowing the above transfers to be carried out.

The following procedure is for cassette use:

Program file to text file:

OPEN 1,1,1, "filename": CMD 1:LIST (return)

PRINT#1: CLOSE1 (return)

The commands should be carried out exactly as above, with the program to transfer in memory. To return a text to program format use:

```
POKE19,1:OPEN1(return)
(cir screen and cursor down three lines)
PRINTCHR$(191):POKE198,1:POKE631,13:POKE153,1(return)
(an error message will appear after a short delay)
CLOSE1
```

The VIC's print centronics interface, which I am now using, is sadly lacking in documentation. Those of you still struggling with the strange hieroglyphics on the cartridge, try the following:

OPEN 129,4,6:CMD 129:LIST - To list a program with LF/CR off

OPEN 4,4,6:CMD 4:LIST - To list a program with LF/CR on

The secondary address of 6 produces the interesting effect of placing all control codes in curly brackets, making program listings far more readable. Some lines may appear a little ambiguous if they contain 20 cursor downs.

For normal use within a PRINT# statement, simply use OPEN 4,4. If you are using easy script with the LF/CR switch off, include the command "If1" at the top of your document. (See page 8-8 in the manual.)

Having raved on about the LF/CR switch, I suppose I should explain what it is. All MX-80 printers or clones arrive with a set of dip switches or wire links located at the inside back of the printer and set to a specific factory condition.

These may be modified to vary the operation of certain functions, such as the paper out bell or the auto line feed and carriage return at the end of each line. An example of the control code handling is below. □

```
ready.
10 rem print out of program
20 rem using vicaprint
30 rem interface with secondary
40 rem address 6
50 rem
60 print"
(CLR)IGN$hello(CUR DN)(CUR RT)"
80 print"
(CR)(HOME)(INST DEL)"
ready.
```


Continued from page 106

Please note that the purpose of these patches is to allow you to run Lotus 1-2-3 with greater flexibility. This is not intended for 'pirating' of proprietary software.

Diskette Reliability

If you have reliability problems with your PC, there is every chance that the diskette drives are the culprits. The 13 cm diskette drives have long been the nemesis of microcomputer owners. We should take some comfort in IBM's decision to use 48 TPI drives instead of the even more problem prone 96 TPI drives.

Some experts say the technology required to produce these drives is simply too complex and delicate for mass production — which is aimed at both low cost and dependability — and for service in an uncontrolled environment. The problem is not peculiar to the Tandon and CDC drives used in the IBM-PC, other micro owners are in the same boat. So, what can the users do?

First, protect yourself against the potential loss of data associated with a failure. Use only good quality diskettes. Cheap, unreliable diskettes are a false economy. I've been using Verbatim Datalife diskettes for over a year without any media related problems (touch wood), but I'm sure other manufacturers have comparable products. Set up an effective set of back-up procedures and follow them religiously. If you do not have at least one back-up copy of each of your data and program diskettes, you are asking for trouble.

There are two ways to create a back-up diskette from a formatted diskette. DISKCOPY is generally the command to use because it creates an exact image, it is fast and it can format an unformatted diskette as it copies. Remember that DISKCOMP should be used immediately after DISKCOPY, to ensure the integrity of the copy diskette.

If a diskette has defective tracks (reported from formatting) or has had a large amount of file creation/erasure activity, it is recommended that you use COPY *.*. Copy *.* copies one file after the other and causes a new File Allocation Table (FAT) to be made. This may result in space saving.

Second, treat diskettes with the care they demand. Read and obey the manufacturer's guidelines. If anything happens to a diskette, such as bending it

or having something spilt on it, discard it immediately and get out a back-up copy. If you put a damaged or contaminated diskette in the drive, you run the risk of damaging the read/write heads.

Third, keep the heads of the diskette drives clean. The frequency of cleaning will depend on frequency of system use and quality level of the diskettes used. A new diskette used in a drive will clean heads because of the wiping action, but it often doesn't clean adequately.

For preventative maintenance you should periodically use a cleaning diskette. The cleaning diskette is made of a white, non-abrasive, fibrous material. Just follow the manufacturer's instructions. Do not try other types of cleaning, such as scrubbing the heads with a swab.

Fourth, have your diskette drives serviced regularly. The engineer will check for head damage and misalignment. While many factors effect the frequency of servicing, I would suggest a minimum of once a year.

Apart from a good vacuuming inside the system unit and printer, there is little other preventative maintenance required on the IBM-PC. □

READER'S CARTOONS

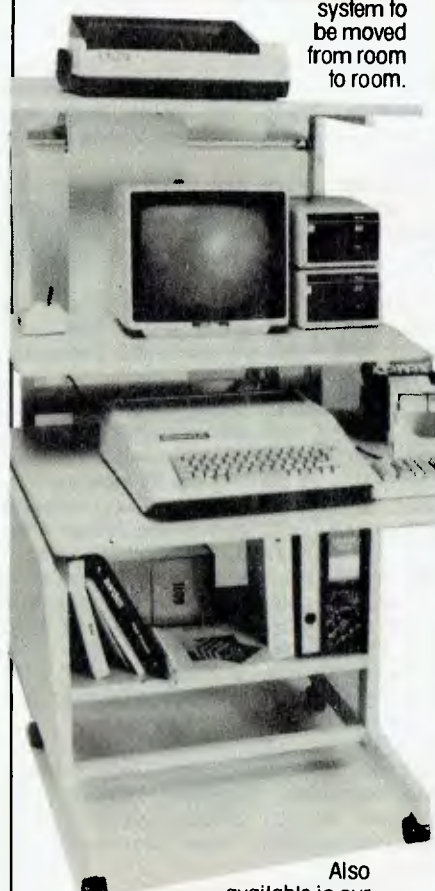


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advertisery index

ACT	OBC
AED	36
Aeon	111
Adaptive Electronics	16
Applied Technology	42-43, 90-91
Archives	IFC,3
Arcom Pacific	15
Austrian Computer Soc.	52
Automation Statham	13
BF & N Publishing	95
Bayne & Trembath	17
Carpe	98
Case	31
Centre Industries	11
City Personal Computers	10
Comm. & Prof. Microcomputers	14
Compton	57, 109
Complete Solutions	66-68
Computer Edge	111
Computer Max	8
Computer Play	39
Computer Spot	23
Data Decor	125
Data Flow	25
Data Peripherals	70
DeForest Software	17
Dick Smith	118
Microtrix	120
Direct Computer Sales	32
Electro Med	18
Gammon & Gobbett	86
Info Ware	12
Lothlorien	115
Magmedia	74
Maxwell	74
McLagan Wright	75
MICC	107
Micro Flex	129
Micro International	92
Micro Mail	59
Micro Ware	129
Microvisions	78
Mini Comp	104
Mytek	92
3M	28
Nashua	7
Necisa	34-35, 87
Olympia	88
Progressive Software	27
Robotron	114
Rod Irving	82, 99, 105
Roland	IBC
Rolvi	127
Software City	38
Sourceware	33
Southern Cross	69
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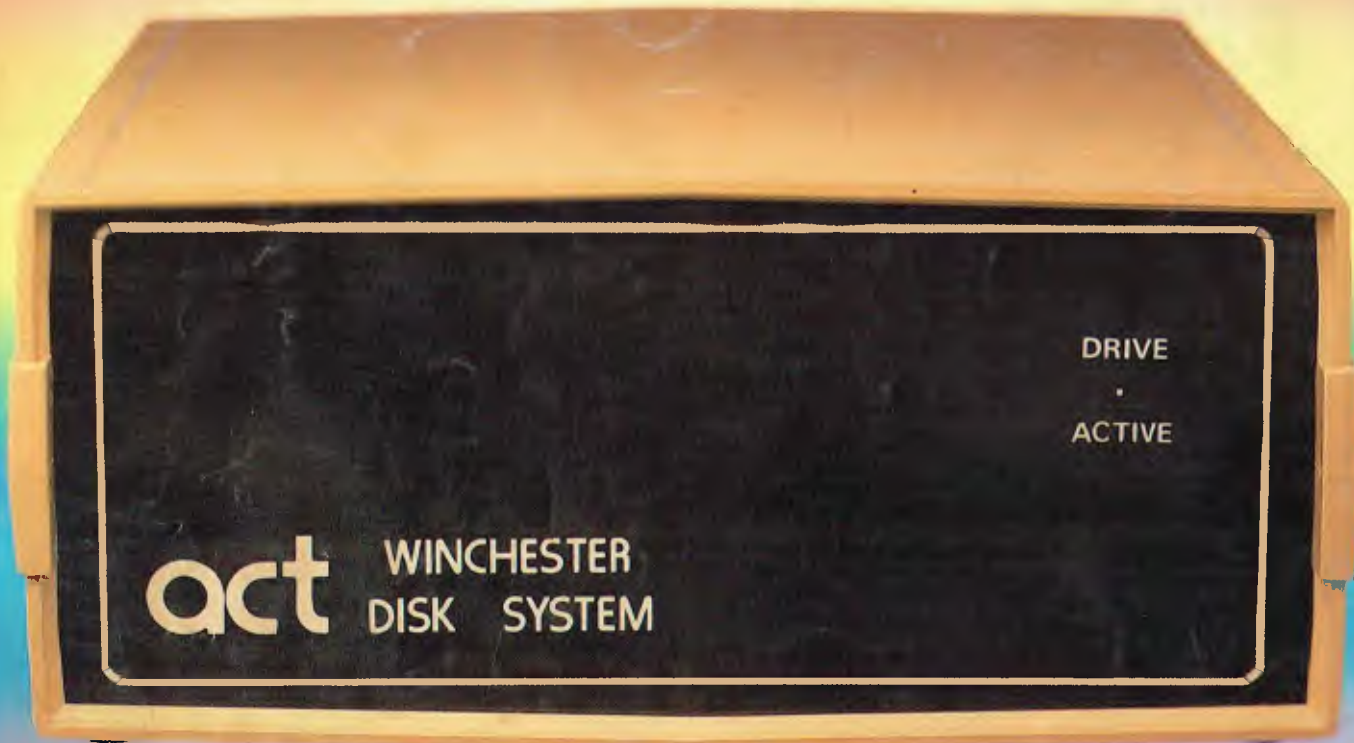


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